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## SERVICE ON COMMISSIONS.

The selection and retention in service of men of the highest standards of ability is one of the most important problems of regulation by commission. An interesting discussion of this problem is contained in the recent letter of resignation of Public Service Commissioner George W. Anderson, of Massachusetts, addressed to Governor Walsh, the promotor and signer of Chap. 616, Acts of 1914, which requires the members of this commission to devote their whole time to the business of the board. The retiring commissioner is known to have resigned because of this act, and although his term upon the commission lasted but a year or two, his reputation as a public official of keen insight, of the highest standards of personal honor, and great powers of clear expression has gone far. Consequently his views upon the relation of this law to the selection of commissioners are of more than local interest.

Mr. Anderson points out that the inevitable tendency of such legislation is to fill places upon the board from two classes of men: first, those of independent means; and second, those whose demonstrated earning capacity is less than the salary now paid (which is $8,000 in Massachusetts). He contends that the sympathies of the first class are inherently too much akin to the needs of the public-utility corporations to warrant the composition of a commission on this basis; and with regard to the second class, states that men entirely dependent upon the emoluments of office for the livelihood of themselves and their families are almost certain to be constant, conscious or unconscious, candidates for reappointment, and that they cannot live and act in an atmosphere of freedom. The mere fact that the salary is as much as that paid superior court judges makes the situation no better. The state has always commanded a high order of ability and character for the bench for very moderate salaries, because these appointments are for life with pensions provided for disability and old age. But, according to Mr. Anderson, these short-lived appointments on commissions "must necessarily be but episodes in the careers of men of real force and ambition." In his opinion, the importance of permitting this class of public servants to retain some outside business or professional work is not that they may have a larger income, but that they may be independent of the anxiety for reappointment, "ready on necessary and proper occasion to risk their official lives in defense of their convictions of what their public duty requires. . . . To get a strong public service commission, the state must either appoint for life or for long terms, as judges

are appointed, or the field must be kept open, as it has hitherto been kept open, for those who retain outside business in order not to be overanxious for reappointment."

"Your new policy," says the letter, "magnifies the importance of clerkly observance of office hours and minimizes the importance of vision, of sense of public need and public right, of independence of control of financial interests. It disregards the vital distinction between places in which mediocre administrative fidelity is the essential and places which call for the best there is in our best men. It would be far better to reduce the salaries one-half and keep the field open to men of genuine public spirit and independent earning capacity, rather than, by making the salary substantial, to increase the avidity and number of the job-hunters."

With much of the foregoing, we are inclined to think our readers will agree, but in states where a large volume of business presses upon the commission, we think there can be no question about the need of full time being given to the duties of the board. Too often companies in need of authority for the issue of new securities or seeking a reasonably prompt decision in rate cases find the overcrowded condition of the commission docket a very serious detriment to efficient administration. In Pennsylvania recently a new project was abandoned because there seemed no hope of the commission reaching a case on the docket which required only that it issue a certificate. It would seem a fair solution of the problem to make the conditions of membership on such a board sufficiently attractive in tenure of office and in compensation to hold the services of the type of men whose work on the bench and in the higher reaches of the professions commands the respect and honor of American citizens. The prompt and efficient dispatch of the public business is the main desideratum and there is certainly no stronger factor in securing this than adequate tenure of office.

## THE USE OF ELECTRICITY IN WARFARE.

Probably every war of much magnitude during the last half century has utilized the electric current in some manner not known to previous armies and navies. Electrical invention has continued so steadily that every interval between wars is bound to bring forth some new application which can be utilized by either military or naval forces or perhaps by both. The operations of the field forces in the present European conflict are so surrounded with secrecy and the reports reaching the outer world are so carefully censored, that but little can be said as to the extent to which new appliances have actually been utilized at the scene of battle. And even if the avenues of publicity were open, it is not probable that the correspondents of newspapers and magazines would pay much attention to technical matters of this nature. It may be of some interest, however, to recount the various applications of electricity which are available to the contending forces which struggle for supremacy upon land and sea.

It was not long after the invention of a practical electric telegraph before this means of communication was utilized by armies in the field, and it continued for many years as the principal means of rapidly dispatching messages. In modern times it has been largely, but not entirely, displaced by the telephone and the wireless telegraph. For telephone and telegraph purposes, insulated wires can be rapidly run directly upon the ground. For wireless purposes portable field sets are available, and for longer distances where more power is required, generating sets may be utilized which are driven by the gas engines of motor vehicles. The same or similar generators may be utilized for operating searchlights. Perhaps the only type of electric vehicle suitable for army use is that carrying its own generating equipment, since dependence cannot be put upon permanent sources of electric energy for charging batteries.

Rumors have reached the outside world that where power stations have been available near the scene of conflict conductors charged to a high voltage have been placed in the path of expected charges, in addition to the usual wire entanglements. The efficiency of such a procedure cannot be regarded as very great, and would depend largely upon the unpreparedness or ignorance of the enemy in meeting such a move. The difficulty of keeping high-voltage conductors insulated without making their purpose manifest, and the ease with which they could be made harmless by grounding would interfere largely with their success, which would depend upon surprising the assaulting force. The usefulness of this scheme would therefore be very limited.

Portable flash lamps are by no means new but have heretofore been little used in the field. It is reported that the German soldiers are supplied with them in large numbers.

Of the agencies above mentioned, the radiotelegraph must be regarded as the most important and most revolutionary. Communication between headquarters and different army corps, between different forces associated in an engagement, between scouting parties and the like, is one of the most important elements in the conduct of a campaign. The wireless telegraph, and for short distances, the wireless telephone, present the simplest means of communication, at least for the mobile elements. They constitute the most pronounced departure from previous practice of the signal corps, and have greatly simplified many of the problems of this department in its field work. The bottling up of any force so that it cannot communicate with the outside is a thing of the past. In the hands of spies, also, it is a most useful and formidable weapon, and great precautions have apparently been taken in the present conflict to discover and punish attempts of this nature.

Wireless apparatus has also been used on aeroplanes and dirigible balloons, although communication under such conditions is necessarily limited to

short distances. Nevertheless it is very useful in scouting, especially where there is great possibility that the scout may never return.

An activity that depends upon the electric current for its success, though not usually connected with it in the popular mind, is represented by the automobile, the aeroplane and the dirigible balloon. Each of these depends for its propulsion upon the gasoline engine, and gas-engine ignition is dependent upon an electric spark. Deprive the engine of its electric battery, primary or secondary, and it becomes useless. All three of these instruments of transportation have been widely utilized in the present conflict, but all would be useless without the assistance afforded by the vital spark.

Turning to naval applications, we find radiotelegraphy again among the important electrical applications, and here it is more indispensable than upon land. For vessels out of sight of each other it is the only means of rapid communication, and even at close range it is more satisfactory than wigwagging. In the battleship the electric motor and the incandescent lamp find an enormous field for application. Electric propulsion has been tried, and it has been announced that it will now be applied to a battleship. Internal signaling systems, searchlights, control apparatus, X-ray apparatus, and various conveniences afford opportunities for utilizing electric energy, and wherever it can be utilized it is found to be the most satisfactory agency. The modern gyro-compass is electrically driven, and the indications of the master compass are electrically transmitted to other parts of the vessel. The magnetic compass has always given trouble upon steel ships, and this trouble has reached a maximum upon battle ships, with their huge masses of movable steel. The motor-driven gyro-compass is ending all that.

The submarine vessel is even more dependent upon electric equipment than the battle ship. While it is possible to drive such craft by gasoline engines (dependent upon an electric spark), motor drive with storage batteries offers the most satisfactory solution for propulsion, as well as for various auxiliaries. Torpedoes are not only driven electrically, but they can be controlled and steered from a distance by means of electric waves, thus making them much more effective and their handling more accurate.

Electrically exploded mines, whether at sea or upon land, constitute a fearful weapon of offense and one which has been used with telling effect in the present war.

To conceive what warfare would be without electrical aids, one must picture conditions a century ago, when its practical applications were unknown. While more powerful explosives have been invented and the weapons of both artillery and infantry have been improved, conditions of fighting would not be changed in any important way from that time. The use of the electric current connotes the up-to-date.

## HOLDING COMPANIES.

The difference between the status of the holding company in ordinary commercial lines of business and in relation to utility operation has been generally recognized, and the threatened federal legislation for putting this type of corporation entirely out of existence has been avoided. It is recognized that all forms of utility service are natural monopolies, that competition should not exist in this field and that, anyhow, common control of local utility companies in different territories could in no wise influence competition. It is generally admitted that the holding company has some advantages with respect to utility properties and the only question is as to whether such advantages are negatived by overbalancing disadvantages, and whether restrictions should be placed upon such corporations to make them a public benefit and insure the greatest good.

A discussion of this subject was arranged by the American Academy of Political and Social Science during the conference of mayors held recently in Philadelphia, and abstracts of the papers presented upon that occasion will be found in this issue. Two of the speakers confined themselves to defending the holding company and pointing out its advantages. The third, however, discussed the subject from a more critical standpoint, analyzing it in all of its bearings and not attempting to disguise the possibilities in such control which may be inimical to the public interest. Mr. Goodrich pointed out that most of the advantages claimed for the holding company, in the way of efficient management, the joint utilization of legal and engineering talent, etc., can be similarly obtained through management corporations which do not necessarily have financial control of the properties. Moreover, in many instances, no improvements along the line of efficiency have been manifest.

That a holding company is in a better position than the ordinary local utility company to secure funds, and that they consequently do so at better rates, will probably not be questioned. To whom such advantages accrue is, however, another matter, as there may be some doubt as to whether such savings bring advantage to any one other than those connected with the holding company. That injustice may be done to minority stockholders where the holding company has merely a controlling interest, and that injustice may be done to the general public through the uncontrolled issue of securities, has been made only too apparent by examples which are known to everyone, and which are well exemplified in the wrecking of the Chicago and Alton Railroad and the Chicago, Rock Island and Pacific Railway. Mr. Goodrich's remedy for these two evils would be regulation of security issues by some public authority and the elimination of minority stockholders by the purchase of their holdings. With these two possibilities for injustice eliminated there would be no objection to the holding company and any advantages that accrue from its existence could be retained.

## Electric Club of Chicago.

At the meeting of the Electric Club of Chicago, held on November 19, George C. Keech, chairman of the Nominating Committee, reported the following list of nominees for election as officers for the ensuing year: W. R. Pinckard, president; W. D. Ray, vice-president; O. H. Caldwell, secretary; A. B. Hatch, treasurer; P. B. Woodworth, R. I. Phillips, W. G. E. Peirce, G. B. Foster, A. L. Eustice, managers. The election will be held on December 3.

The speaker of the day was Capt. Horace B. Wild. His talk was an aerial travelogue illustrated with a large number of views of balloons, aeroplanes and dirigible airships. He recounted many interesting incidents of his extended experience in flying in various kinds of aircraft and told of the extraordinary use being made of both aeroplanes and dirigibles in the European war. He predicted that aerial craft would be used before long as a means of high-speed and low-cost travel.

On Monday evening, November 23, a dinner and entertainment was held which was attended by 350 members and guests. Music during the evening was furnished by the Commonwealth Edison orchestra of 72 pieces. Chairman W. C. Berry of the Entertainment Committee had charge of all arrangements.

It was announced during the evening that 60 applications for membership had been received during the past week.

## Resonance Phenomena.

At the meeting of the Institute of Radio Engineers held at Fayerweather Hall, Columbia University, on November 4, H. E. Hallborg, engineer in charge of the Marconi transatlantic station of New Brunswick and Belmar, read a paper on "Resonance Phenomena in the Low-Frequency Circuits of Radio Transmission." In this he discussed the tuning of the audio-frequency transformer, such as 60 or 500-cycle, to obtain maximum efficiency with proper note as used in the quenched-gap method. Two methods of tuning were described; one based on the ratio of the primary current to the secondary capacity and the other based on the ratio of the potential across the secondary capacity to the primary potential, the capacity being varied for maximum secondary potential with given potential across the primary. For quenched-gap use, to obtain a good note, it was found that a capacity should be used across the secondary which would throw the generator-transformer-capacity circuit about 12 to 15 per cent out of tune with the frequency of the machine; that is, at about 12 or 15 per cent higher frequency than that of the machine. Low resistance in the primary and secondary was found to be desirable and where but one condenser capacity is to be used across the secondary, it is desirable to have all the inductance in the transformer and generator rather than part of it in outside circuits. It was also found that by careful disposition of windings, sufficient leakage could be obtained to use the more economical closed-magnetic-circuit transformers, rather than the more common open-magnetic-circuit transformers.

## Electric Furnace Discussed By New York Electrical Society.

At the meeting of the New York Electrical Society, held on November 11, an address was made by Woolsey McA. Johnson, relating to the subject of electric furnace loads for hydroelectric plants. Mr. Johnson called attention particularly to the discrepancy in the average heating value of coals and the comparative relation of heating coal to electrical energy. A short ton of coal of a heating value of 11,147 British thermal units per pound for manufacturing purposes, costs in the United States an average of $2 per ton. This possesses exactly the same number of heat units as the electrical energy represented in two horsepower-hours, which costs for manufacturing about $80.

Only a certain maximum theoretical temperature is possible in burning coal, say 1,950 degrees Centigrade; practically 1,600 degrees Centigrade, because of inefficiency of combustion. Therefore, this sets the temperature limit to which the heat of combustion of coal may be raised and utilized. The thermal efficiency of indirect heating, that is, by passing heat through a wall of a vessel in which the charge is placed is very low. On the other hand, the thermal efficiency of electric heating is nearly independent of the temperature used and we can apply electrical heat at 1,800 degrees Centigrade in a better way and at a higher thermal efficiency than at 1,200 degrees Centigrade.

Electricity puts the heat exactly where it is needed and at a high efficiency. Its convenience is one of the principal elements of its usefulness.

With regard to the relation of the electrothermal load on a hydroelectric station, Mr. Johnson points out the natural development feature of this agency. He holds that the future field for utilization of large volumes of hydroelectric energy depends principally on electrochemical loads and that the financing of hydroelectric power plants will be rendered easy and efficient just as the electric furnace is properly developed on scientific and commercial lines.

Mr. Johnson discussed the possibilities of increasing the usefulness of the electric furnace in the smelting and refining of complex zinc and copper ores and in the making of chemical glass, in brass melting and in the reduction of silicon, aluminum, calcium, calcium carbide, sodium and ferro-silicon.

## Annual Meeting of Electrical Credit Association of Chicago.

The nineteenth annual meeting of the Electrical Credit Association of Chicago was held at the Chicago Athletic Association on November 19. Addresses were made as follows: "Moral Risk Clubs and General Conditions," C. C. Gray, Detroit; Ernest B. Daulton, Cincinnati; W. J. Burton, St. Louis; E. W. Shepard, Cleveland; Edward Pfleger, Milwaukee; Bert Walsley, Denver.

"The Association Service, Etc.," J. D. Meek, Indianapolis; W. P. Johnson, Chicago and Clyde C. Miner, Springfield.

"The Basis of Establishing Credit Limits," Thomas I. Stacey and A. J. Klein, of Chicago.

"Cash Discounts," John N. Kirby, Cleveland; Benjamin P. George, Chicago; F. W. Seywert, Cleveland.

The annual dinner was given on the evening of the same day at the Athletic Club, when addresses were made by Dr. John Timothy Stone, pastor of the Fourth Presbyterian Church of Chicago; E. D. Hulbert, vice-president of the Merchants Loan & Trust Company, of Chicago, and George T. Buckingham, of the law firm of DeFrees, Buckingham & Eaton, Chicago. The banquet entertainment closed with a lighter contribution by Abram Mendenhall.

Officers for the ensuing year were elected as follows:

President, Henry Schwab, Monarch Electric & Wire Company, Chicago.

Vice-President, A. O. Kuehmsted, Gregory Electric Company, Chicago.

National Representative, Frank M. Pierce, Manhattan Electrical Supply Company, Chicago.

Secretary and Treasurer, Frederic P. Vose, Chicago.

Members of the Executive Committee, Thomas I. Stacey, Electric Appliance Company, Chicago; S. E. Kennedy, Central Electric Company, Chicago; E. R. Gilmore, Western Electric Company, Chicago; Benjamin P. George, Beardslee Chandelier Manufacturing Company, Chicago; E. M. Hawley, General Electric Company, Chicago.

The secretary's report showed that the claims adjusted during the year amounted to 5,059, involving $358,289.63; the total claims adjusted since organization amounted to 32,012, involving $2,553,119.59.

# Electricity in Carriage Building.

**This article presents detail data relative to the motor installation in a modern factory devoted to the manufacture of carriages and high-grade automobile bodies. The advantages of electric motor drive are also discussed and data presented on the horsepower required to drive woodworking machines under various conditions.**

The C. P. Kimball Company of Chicago is one of the large manufacturers of automobile bodies and carriages to appreciate the advantages and economies of central-station service and the establishment of this company recently completed at Michigan Avenue and Thirty-ninth Street is one of the most modern woodworking plants of its kind in the country.

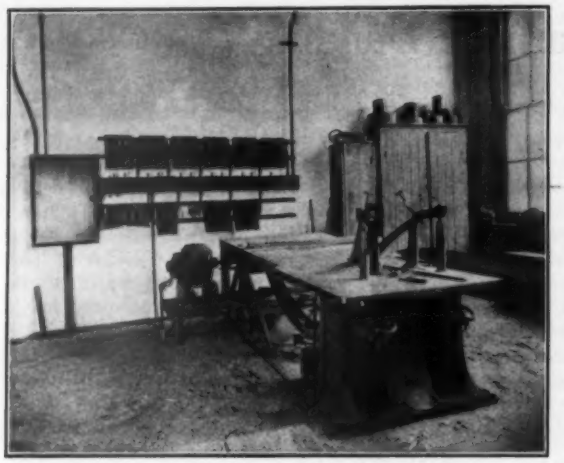
Because Commonwealth Edison service had been decided upon before the building was designed, the company was permitted to take every advantage of construction and arrangement of machinery and equipment in the erection and layout of the factory. The principal product of the Kimball company is high grade automobile bodies of the limousine type and as considerable space is needed for handling and storing, the use of electric motors has enabled the company to make a much more suitable utilization of space than would be possible under any other system of drive.

Section of Blacksmith Shop in C. P. Kimball & Company Factory. In Foreground Five-Horsepower Motor Driving Emery.

Individual drive is used throughout with the exception of the machine shop, and this made it possible to arrange the various machines so that there would be sufficient room between machines and departments and also to so locate the machines that the sequence of work could be carried on with a minimum amount of handling of material. Another noticeable feature of the Kimball installation is the arrangement of machines so as to take full advantage of the natural light available on two sides of the building. This latter feature has been so carefully planned that only on the darkest days is it necessary to use artificial illumination.

Dry kilns are of course necessary in any woodworking plant and as steam is required for these a boiler equipment is provided. In the Kimball factory two water-tube boilers are provided, generating steam at 75 pounds pressure. The wood waste is burned in these boilers but as only the most expensive grades of hard wood are used and economy in cutting and dressing insisted upon, the waste is not sufficient, even in summer when no heating of buildings is required. The average coal consumption during the summer months is 10,000 pounds per month, while during the heating season the average monthly consumption is 565,000 pounds. The space occupied by this heating system is negligible when compared with the room that would be necessary for a private power plant and here another advantage of central-station service is demonstrated.

Because of the peculiar conditions at the Kimball plant, an abundance of steam is generated and the excess



Motor-Driven Shaper at Kimball Plant.

Motor-Driven Swing Saw at Kimball Plant.

above that required for dry kilns and heating system is used to operate two low-pressure engines which drive the main exhaust fans. As these fans operate continuously during the day the steam operation under the conditions mentioned is more economical than electric drive.

Energy for all other power and for lighting is purchased from the Commonwealth Edison Company and delivered to the plant as 220-volt, three-phase alternating current.

The blacksmith shop is located in the basement, and uses 33.5 horsepower in motors. This department handles the bulk of the metal used in body manufacturing, and the equipment includes 12 one-seventh-horsepower motors operating a like number of forge blowers. These are controlled by hand speed regulators. There are also three 5.5-horsepower motors, each belted to two 16-inch emery wheels which are controlled by push-button automatic starters. A three-horsepower motor is used to operate two emery belts in this department. A number of drill presses are also employed, the larger machines being operated by two-horsepower motors, and the smaller by 1.5-horsepower motors. All of these machines are controlled by hand starters.

The machine shop is also located in the basement, the machines in this department being driven by one five-horsepower motor through shafts and belting. The usual complement of machine-shop tools is found in this department, such as engine lathes, milling machines, shapers, grindstones, etc.

The body shop is equipped throughout for individual motor drive, the machines comprising a six-horsepower motor operating a double spindle, twelve-inch shaper; a ten-horsepower motor running a large planer, two five-horsepower motors operating two 16-inch rip saws, one four-horsepower motor running a tenoning machine, a five-horsepower motor running a large swing saw, one four-horsepower motor operating a 42-inch band saw, and one 2.5-horsepower motor running a 36-inch

Five-Horsepower Motor Direct-Connected to Band Saw.

Five-Horsepower Vertical Motor Driving Boring Machine.

## Carriage Manufacturing Data.

C. P. Kimball & Company, Chicago, manufacturers of coaches and automobile bodies, particularly of the limousine type.

Total connected horsepower, 183. Total number of motors installed, 42. Average kilowatt-hours per month, 3,990.

Kilowatt-hour consumption for 12 months:

| Month | Kilowatt-hours | Month | Kilowatt-hours | Month | Kilowatt-hours |
|---|---|---|---|---|---|
| January | 5100 | May | 3470 | September | 4160 |
| February | 3972 | June | 3250 | October | 3750 |
| March | 3150 | July | 3040 | November | 4490 |
| April | 3470 | August | 3320 | December | 6190 |

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. Energy is supplied by the Commonwealth Edison Company.

| No. | Horse-power | Speed R. P. M. | Application. |
|---|---|---|---|
| 3 | 7.5 | 975 | Each belted direct to two 16-inch emery wheels, pulley 7 by 4.5-inch face, speed of machine 1,130 revolutions per minute. |
| 1 | 3 | 1,750 | Extended-shaft motor driving two emery belts. Size of pulleys 5 by 5.5 inches, speed of machine 2,100 revolutions per minute. |
| 1 | 2 | 875 | Belted direct to one large drill press. Pulley 11 by 3.75-inch face. Speed of machine 300 revolutions per minute. |
| 3 | 1.5 | 850 | Each belted direct to a 20-inch drill press. Pulley 12 by 3-inch face. Speed of machine 284 revolutions per minute. |
| 1 | 1.5 | 850 | Belted direct to rotary blower. There are also 12 one-seventh horse-power motors in this department operating 12 forge blowers. |
| 1 | 5 | 1,120 | Belted to line and countershafting in machine shop driving small drill presses; two lathes; one milling machine; one grindstone. |
| 1 | 5 | 1,425 | Fully inclosed motor belted direct to a 12-inch double-spindle shaper. Pulley 3.5-inch by 5-inch face. Speed of machine 4,800 revolutions per minute. |
| 1 | 10 | 1,260 | Belted direct to a 30-inch single-head planer. Pulley 4.5-inch by 5-inch face. Speed of machine 4,321 revolutions per minute. |
| 2 | 5 | 1,425 | Belted direct to two 16-inch rip saws. Pulley 4.5-inch by 5-inch face. Speed of machine 3,150 revolutions per minute. |
| 1 | 4 | 960 | Direct-connected to a tenoning machine. |
| 1 | 5 | 960 | Belted direct to a large swing saw. Pulley 5-inch by 5-inch face. Speed of machine 2,700 revolutions per minute. |
| 1 | 4 | 450 | Fully inclosed motor direct-connected to a 42-inch band saw. |
| 1 | 2.5 | 1,120 | Belted direct to 36-inch band saw. |
| 1 | 5 | 1,425 | Belted direct to a 16-inch jointer. Pulley 4-inch by 5-inch face. Speed of machine 4,065 revolutions per minute. |
| 1 | 5 | 1,425 | Fully inclosed motor belted direct to a six-inch single-spindle shaper. Pulley 3.125-inch by 5-inch face. Speed of machine 4,750 revolutions per minute. |
| 1 | 5 | 2,700 | Fully inclosed motor direct-connected to a six-inch high-speed ball-bearing shaper. |
| 1 | 2 | 1,175 | Vertical motor belted direct to a boring machine. Pulley 5-inch by 4.75-inch face. Speed of machine 1,469 revolutions per minute. |
| 1 | 2 | 1,625 | Belted direct to a routing machine. Pulley 2.25-inch by 3.5-inch face. Speed of machine 4,300 revolutions per minute. |
| 1 | 1.5 | 1,250 | Belted direct to a wood lathe. Pulley 8-inch by 4-inch face. Speed of countershaft 710 revolutions per minute. |
| 1 | 1.5 | 1,800 | Belted direct to a small emery wheel. Pulley 3.75-inch by 3-inch face. Speed of machine 1,600 revolutions per minute. |
| 1 | 1 | 780 | Belted direct to a metal-workers' hammer. Pulley 2.625-inch by 2-inch face. Speed of machine 857 revolutions per minute. |
| 1 | 0.2 | 750 | Belted direct to a saw file operating at 97 revolutions per minute. |
| 1 | 5 | 1,425 | Fully inclosed motor belted direct to a 16-inch jointer. Speed of machine 4,065 revolutions per minute. |
| 3 | 5 | 1,425 | Fully inclosed motors each driving two 16-inch buffing wheels. Pulley 4.5-inch by 4-inch face. Speed of machines 2,190 revolutions per minute. |
| 1 | 5 | 1,425 | Fully inclosed motor belted direct to a six-inch single-spindle shaper. Pulley 3.5-inch by 5-inch face. Speed of machine 4,550 revolutions per minute. |
| 1 | 2.5 | 500 | Direct-connected to a 36-inch band saw. |
| 1 | 3 | 1,750 | Fully inclosed motor belted direct to a sanding machine. Pulley 5.5-inch by 3.25-inch face. Speed of machine 1,950 revolutions per minute. |
| 1 | 0.5 | 550 | Belted direct to a small drill press. Pulley 4-inch by 1.25-inch face. Speed of machine 760 revolutions per minute. |
| 1 | 3 | 1,120 | Belted direct to hair picker. |
| 2 | 0.5 | 1,750 | Operating two groups of sewing machines. |
| 1 | 3 | 500 | Fully inclosed motor direct-connected to a 36-inch band saw. |
| 1 | 3 | 1,425 | Fully inclosed motor belted to two buffing wheels operating at a speed of 1,469 revolutions per minute. |
| 1 | 25 | .... | Operating 5-ton freight elevator. |
| 1 | 15 | .... | Operating passenger elevator. |

band saw, one five-horsepower motor operating a 16-inch jointer, one five-horsepower motor running a six-inch single-spindle shaper, and one five-horsepower motor running a six-inch high-speed ball-bearing shaper. All these machines are controlled by push-button automatic starters. There are also two two-horsepower motors, two 1.5-horsepower motors, and one one-horsepower motor, running smaller machines in this department and controlled by hand starters.

In the wood shop an aggregate horsepower of 31 is installed, there being five five-horsepower motors operating jointer, buffing wheels and shaper; one 2.5-horsepower motor operating a band saw, one three-horsepower motor operating a sanding machine, and one 0.5-horsepower motor running a small drill press. All of the machines in this department are controlled by hand starters.

In the trimming shop a three-horsepower motor is used to drive a hair picking machine for upholstering. There are also two 0.5-horsepower motors running two groups of sewing machines, and a three-horsepower motor belted direct to a 36-inch band saw, the latter being controlled by push-button automatic starter.

In the department known as the "Fitting-up Room," where bodies and upholstering is assembled, a three-horsepower motor is installed, running two buffing wheels.

One elevator for handling cars and bodies and one passenger elevator is installed in the Kimball plant, one a 25-horsepower equipment, and one a 15-horsepower equipment, operating a push-button passenger elevator.

There are numerous applications of small motors, such as a signal system for calling department heads to telephone, a clock in the tower of the building, ventilating motors, etc.

The illumination of the Kimball factory is in keeping with the motor installation, and is modern in every respect. A late type of industrial steel reflector is used in all parts of the shops, and incandescent lamps numbering 2,000 are employed throughout. In the display room 15 400-watt Mazda lamps are used. The detailed motor installation at this plant is tabulated in the accompanying data sheet.

The advantages of motor drive applying at the Kimball plant are more or less common to all woodworking establishments, except that the question of wood waste becomes more important. The advantages of motor drive may be reviewed as follows:

It greatly reduces the waste of power in transmission and thereby increases production for a given amount of power generated.

Experience has shown that it improves the quality of the product and increases the factor of safety both to machinery and operatives, while at the same time there is a marked reduction in the fire hazard.

It practically eliminates overhead shafting and belts which not only disseminate dust and interfere with the proper distribution of light and air, but frequently limit the location or re-location of machinery and thus prevent that uninterrupted sequence of operations which is essential in order to avoid the rehandling of work with its attendant expense, damage, and congestion.

It effects a reduction in the amount of floor space required and combines an improvement in the general appearance of a plant, with cleanliness and safety.

An important feature of individual motor drive is the ability to operate any group of machines or any separate machine overtime or at unusual hours without putting the whole plant into operation. This feature is of especial importance when the current is obtained from an outside source as in that case the cost of running any machine stops when the machine does.

The majority of the wookworking machines are operated intermittently; the tools being run at high speed complete the cut quickly and an off-load period occurs between the completion of one cut and the beginning of another. This permits the rating of the motors on a very favorable basis as they will withstand temporary overloading without injury. When designing a woodworking plant it should be borne in mind that electric drive will permit of additions being made to the original plant without interfering with the apparatus already installed.

Inasmuch as motor drive does not require the heavy shafting and belting inseparable from mechanical drive, the building itself may be of lighter construction, as the motors may be installed on the floor, wall or ceiling and connected to the machines by short belts, or they may be directly coupled to the driving shaft of the machine.

The saving in the cost of building the average mill rendered possible by the adoption of motor drive will ordinarily, due to the lighter construction required, amount to about 5 per cent of the total cost of construction. In an old building motor drive will permit the re-location of the machinery to facilitate and increase production and in addition will usually effect economy in the floor space required, as well as insuring better lighting conditions.

Two Motor-Driven Machines in Body Shop.

The application of the individual electric motor to drum sanders shows a number of the points of improvement mentioned above. The rolls of a drum sander are heavy and require considerable pull to get them started and running at full speed. In a small plant, using lineshaft and steam-engine drive, it is very common to see the complete equipment slow down materially when the sander belt is shifted to start the sander, and in many cases it is a full minute before the speed comes back to normal.

There is, of course, a slight decrease

in the amount of work done at this time, due to the lower speed, but there is a more serious loss, namely, the poor work which is turned out by the machines with the slower speed. In many machines a large drop in speed causes tool marks in the work, causing it to be run over again, scraped or sanded, or in some cases discarded. This belt slippage and change of speed cannot be eliminated, and only becomes less objectionable as the size of the plant is increased, so that the power required by the sander represents a smaller proportion of the total.

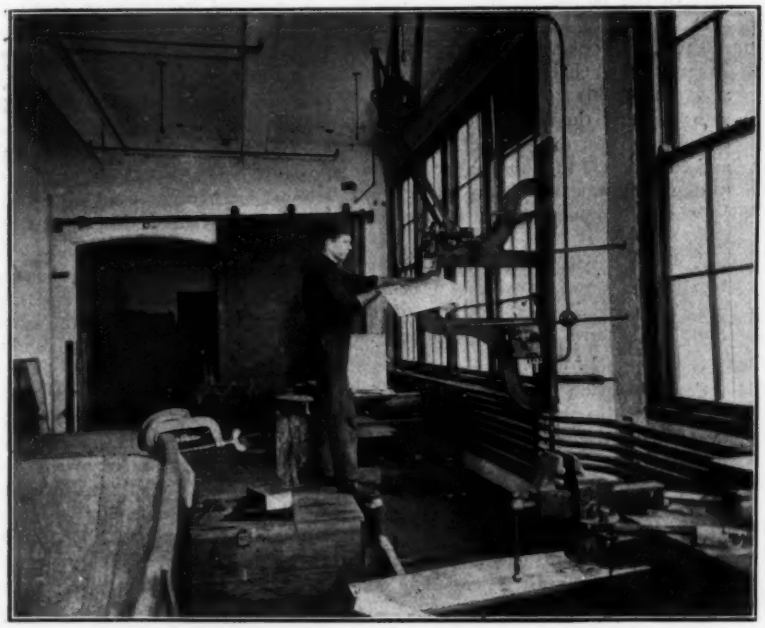
When the sander is driven by an individual electric motor, with power supplied from a central-station circuit, as is the most satisfactory and economical method in all small and many large installations, there is no such drop in speed in the other machines, and the consequent saving is thus a point of economy for the electric drive.

The actual power required to sand a plane surface is very small, but to remove only a small fraction of an inch of hardwood may take several horsepower. It often happens in made-up and glued stock that there are irregularities which must be taken down, and this means a heavy load on the motor. Consequently, when running there will be wide variations in the power requirements, varying from the friction load of the machine to a considerable overload on the motor. With line-shaft drive a varying load means varying belt slip, which, traced back to the prime mover, amounts to many per cent, causing speed fluctuations all along the line, and likewise affecting the production of all of the machines.

Individual motor drive gives a practically uniform speed over a wide range in load, and any slight variation that may occur does not affect any other machine. With the belted motor drive as above outlined, the friction load of the machine, which includes that of the countershaft, is often a very large percentage of the total power required when working on average stock. It may, for instance, constitute from 50 to 75 per cent of the load, and this high value is due in a large part to the bearing friction caused by the four tight belts, not considering the feed belt.

To overcome this waste of power, a geared drive, with a motor for each roll and one for the feed, has been designed and has proven quite satisfactory. The saving in power, based on practically continuous operation, would amount to more than $5 per month, and, besides this, the item of belt maintenance is entirely eliminated. No auto-starters are required for motors of this size, and the knife switches used for connecting the motor to the line are inclosed in metal boxes mounted on the wall and post. Metal conduit is used for the motor wiring, which practically eliminates all fire risk from that source.

With an individual gear drive as above outlined there is a definite and positive speed for each drum, while with belt drive there is the ever-present belt slip. There is no method, when belting from a countershaft, to maintain the same tension in all three of the belts, consequently there is a different amount of slip in each belt. The slip increases rapidly with increasing load, so that it may happen that the drum which should be doing the most work is doing hardly any. This shifting of the load reduces the capacity of the machine, also increases the wear on the sandpaper, since the work is not done by the proper paper.



Section of Trim Shop at Kimball Plant.

The selection of the proper motors for driving woodworking machines is of the utmost importance and should be given the proper consideration by power engineers. If only direct-current supply is available, motors should be compound wound or of the interpole variety, since it is absolutely essential that the motors be capable of resisting the inherently excessive peaks which are apt to occur during the all-day load of the great proportion of woodworking machinery. Direct-current motors should be totally inclosed, except in those special cases where the driving machines are ceiling-suspended away from shavings and sawdust or located in a separately partitioned room, in such a manner as to eliminate all fire risk.

Large motors should be artificially ventilated and supplied with piping to and from outlet openings (1.5 cubic feet of air per minute per horsepower is usually sufficient). All controlling appliances of whatever nature, if exposed to sawdust and shavings should be totally inclosed.

Where alternating-current supply is available, the polyphase induction motor with high-resistance squirrel-cage rotor should be specified, since the high-resistance rotor permits quick and frequent acceleration and provides the heavy starting torque required to overcome the inherently great inertia of woodworking machines. The type of alternating-current polyphase motors with polar-wound rotor and internal starting resistance, while possessing admirable torque and starting current characteristics, is not generally recommended for woodworking machines since sawdust almost invariably may be expected to collect on the starting resistance. In a few cases where variable speed with electrical control is desired, polar-wound internal-resistance rotors with collector rings and external resistances may be used. However, specifications should call for inclosed collector rings in installations of this kind.

## Specific Heat of Copper.

The specific heat of copper has been determined by D. R. Harper, of the Bureau of Standards, using an electrical method, to be 0.093 at 50 degrees centigrade. This is in terms of water at 20 degrees. Between 15 and 50 degrees the results may be expressed as $0.0917+0.000048\ (t-25)$.

# Commercial Practice
# Management, Rates, New Business

## Second Conference of Committee on New Business Co-operations of Ohio Electric Light Association.

Attracted by a program of vital importance, and encouraged by the successes of previous meetings, representatives of central-station new business departments from Ohio and neighboring states, gathered in Cincinnati on November 18, on the occasion of a meeting of the Committee on New Business Co-operations of the Ohio Electric Light Association. The meeting, which was held at the Hotel Gibson, was the second of a series of similar conventions to be held during the year which will be devoted to topics relating to new business activities.

Last year this committee, under the leadership of Thomas F. Kelly, sales manager of the Dayton Power & Light Company, who was reappointed chairman this year, held four very successful meetings, which led to their being made a permanent feature of Association work. The growing importance of these gatherings of men engaged in the same line of work is indicated by the fact that the attendance at the Cincinnati meeting was the largest of any so far held.

The delegates were welcomed to Cincinnati by W. W. Freeman, president and general manager of the Union Gas & Electric Company. Mr. Freeman referred to the importance of commercial-department work, and the good that can come from frequent conferences such as this meeting. He referred to the business depression which is being felt to some extent by the central-station industry, but thought that there never was a time when a utility company could less afford to retrench on the commercial department than the present. He thought that good men are needed more now than when business is in a flourishing condition, and the time is suited for special campaigns among the more difficult prospects, who are generally neglected in the ordinary rush of business.

Chairman Kelly replied to the welcome extended by Mr. Freeman, and, commenting on business conditions, called attention to the situation in a locality where the central station had reduced the sales and operating force to a minimum. Several hundred applications for service had been received since this retrenchment, and because of the reduced force much unnecessary delay had to be countenanced by those desiring service. Mr. Kelly thought that this situation was deplorable, and frequently leads to antagonism on the part of the public towards the utility.

D. L. Gaskill, secretary of the Ohio Association, spoke briefly, thanking Mr. Freeman on behalf of the Association at large for his cordial welcome. He also reviewed the work accomplished by the Association during the past years, and emphasized the importance of committee meetings, which are being held by various committees of the Association.

A paper entitled "Industrial Electric Heating as Power Business" was then presented by Dexter Rollins, of the Simplex Electric Heating Company.

### Industrial Electric Heating.

Central-station men are fast beginning to realize the opportunities in industrial electric heating, but up to the present time their service in this field is almost negligible, as compared to the rapid progress which has been made in lighting and power loads. The necessity for this business is reaching a point where it must be seriously considered. The revenue from a candle-power of light is decreasing, due to the increase in efficiency of modern lighting units, the maximum average use of which is about three hours per day. The central-station man is interested primarily in trying to get an even consumption of power throughout the 24 hours of the day, and industrial electric heating is the answer.

From the central-station standpoint this class of business is ideal, if worked out properly, for it brings your consumption nearer to that even distribution, that all of you are working towards. The advantages are obvious—high load-factor, no high peaks, and few variations in the load. The only disadvantages are common with all other new applications, the lack of readily accessible information, and the doubt in the naturally prejudiced mind of the possible consumer. Enthusiasm only is essential to sink these disadvantages to the level of a negligible quantity.

Worthy of consideration are many applications and processes. The installation of household ranges in quantities is a question by itself and demands serious thought. Commercial cooking and baking is already a tried and proven success, and the many efficient installations guarantee their future.

The many hundreds of small applications, unimportant as each may seem, are often the entering wedges for larger and better business. I recall the case of a printing and binding establishment, using steam as a power, as steam was necessary for the embossing. The installation of electric embossing heater saved the day, and motors supplanted the old steam engine.

Taking it for granted that industrial heating is desirable the question is, how is the business to be secured? Primarily the salesman should have a certain amount of necessary knowledge of the inquirers' industry, for there are conditions under which electric heating is not desirable, and limitations that make its application impossible at the present time. Next, the question of substantial and efficient heating units enters. The prospective customer now wants to know two things: First, cost and maintenance cost. You must tell him, and the approximation must be close. First cost is not generally a serious obstacle, but operation and maintenance need careful consideration. At first a comparison between various fuels and their cost is discouraging, and here we depend on one essential, efficiency. Ten cents expended for the several common fuels, will produce a larger number of B. T. U. than the same amount will secure from electricity. But these same heat units are theoretical, when it comes to the point of using them efficiently.

Bringing the discussion down to a tangible and definite consideration, suppose a customer complains of having trouble with gas ovens, used for lacquering metal; he cannot get uniform heat; the quality of work produced is poor, making it necessary to rebake from 15 to 50 per cent of his product. Let's determine to electrify those ovens, for we have decided it's worth while, and the arguments are mostly on our side. Now we can promise this customer a number of things.

We can guarantee to increase his production, raise the quality and increase the uniformity of his product, better the working conditions of his plant, and save him dollars at the end of the year. He informs you he is willing to be shown, but thinks that the cost will be prohibitive.

In examining his ovens we find a metal oven, probably with very poor insulation, heated by an open gas flame, working at less than 40 per cent efficiency, using the other 60 per cent to heat the surrounding air, the workmen, and the outdoor world in the immediate vicinity of a large blower ventilator leading from the ovens, anything but the japan on his metal product. To save a portion of the first cost electric heaters may be installed in his present ovens, but that method is not consistent with our attempt to save him money by increased efficiency. We should recommend new and properly constructed ovens. Assume that it is desired to bake japan on metal of weight, say 800 pounds, that the truck holding this is also metal of 200 pounds weight—1,000 pounds total. In his present ovens he has a weight merely in the oven itself of twice that, 3,000 pounds altogether, that must be heated, with the walls of the ovens radiating and conducting heat uselessly, to the outside. In this case we will recommend an oven constructed of insulating brick, plastered on the outside, and if the truck runs on a track the inside need not be lined with sheet metal, for the latter is costly to heat, and the metal in the product is of sufficient weight for heat storage purposes. An oven of this construction, four-inch thick walls, will have a heat conductivity of not more than four B. T. U. per square foot, per degree difference in temperature per 24 hours, while in the case of his metal oven the walls alone conduct more heat by 200 per cent than the metal put in to be baked. The cost of building such an oven would run $50 per thousand for four-inch brick, $1.50 to $3.00 per kilowatt for heaters, and the labor of installing. I know of an installation of nine ovens, 8 by 8 by 3, which will cost but $3,000, including an elaborate control.

So far the proposition interests your man, but the question and cost of current arises. On a basis of 1,000 pounds in the ovens constructed as suggested, 25 kilowatts is sufficient to bring the temperature to 400 degrees Fahrenheit in an hour's time, and allowing for difference in ventilating, 5 to 7 kilowatts per hour will maintain this temperature. This when computed on a kilowatt-hour basis and presented, will quite likely amount to more than the gas bill, but we have more convincing points to offer. In the ovens, as we recommend them, we can maintain an even heat varying not more than 10 degrees. It will be possible to turn out more bakes in a specified time, and at least 98 per cent of the product turned out of the new ovens will be of a high quality finish, whereas 60 per cent would be above average the old way, and the balance baked a second time.

An absolute case is recalled, in which the production was increased in quantity 20 per cent in the same length of operation, and the quality of finish of much higher grade.

Another attractive feature is the control. There is no good electric automatic control at present that I know of, but I am of the opinion there will be very soon, but the lack of the automatic control, although it is a valuable addition, need not be a cause for failing to secure this business. There are now standard panel boards on the market, especially for this work, and they are complete with pyrometers, contractors, and relays, that all go toward making a complete installation and a satisfied customer.

J C. Matthieu, of Dayton, and F. C. Morrison, of Newark, in opening the discussion on this paper, inquired as to the maximum demand and the kilowatt-hour consumption of the installation referred to in the paper. Mr. Rowllins replied that the installation in the factory mentioned required an average daily consumption of 75 kilowatt-hours during a nine-hour day. The cost for energy is a fraction less than 1 cent per kilowatt-hour. Gas was previously used in this oven.

F. C. Morrison, of Newark, commented on the agitation for extremely low heating rates, which is being given impetus by those interested in this branch of the business, and asked by what right heating customers expect a lower rate than for regular power business. He referred to the high first cost of electric ranges, and thought that this was a detriment to their more universal use. Mr. Rollins, referring to the price of ranges, stated that it was contingent upon output, and could not be reduced under present conditions.

Speaking also of the price of ranges, J. E. North, of Springfield, stated that the prices of the various individual appliances that will do the same work as an electric range, are considerably less than the cost of the range.

D. L. Gaskill, of Greenville, thought that the best way of placing electric cooking on a permanent basis, was to establish it in domestic science schools, and thus educate the coming generation in the economies and advantages of electric heat. He thought central-station companies could afford to make an extremely low rate for this business, because of the advertising value.

Chairman Kelly, referring to energy rates for cooking and heating, inquired if the utility commissions would approve of a cooking rate the maximum of which was lower than the maximum of the power rate. D. L. Gaskill, replying to this, thought that the Commission in Ohio would approve of a low rate for cooking where it could be shown that such a rate would encourage the business.

A. E. Peck, of Lexington, Ky., explained that it was difficult to sell ranges and industrial heating appliances, because of the lack of authentic data available. He contended that the manufacturers should supply the central-station companies with suitable literature and data, which they could distribute to prospective customers.

The meeting then adjourned for luncheon in the Jovian Room of the Hotel Gibson, where W. C. Culkins, executive secretary of the Cincinnati Chamber of Commerce, delivered a very interesting and forceful address on "Salesmanship." Mr. Culkins recited many little incidents in connection with his experiences as a salesman and as a purchaser, and pointed out a moral in each. He emphasized the fact that salesmen should make a sale only where both parties would profit. He also urged that salesmen create a desire on the part of the prospect to buy before the sale is made.

At the afternoon session a paper was presented by R. A. McGregor, of the Toledo Railways & Light Company, entitled "Vital Points in Power Sales Work."

**Vital Facts in Power Sales.**

The two most vital elements in power sales work are rates and application of motor, but as rates today are pretty much in line we do not wish to take this up further than to say that any rate scale recognizing load-factor, capacity, primary delivery and offering inducements for off-peak business, night-valley business and 24-hour business, that is based on local conditions correctly will be found equal to most any business before us.

We often throw up our hands in horror at some low rate we hear of and some central-station men have been influenced by rates quoted by other companies without giving the matter the necessary study to find on what conditions the rate is quoted.

But enough of rates, for in industrial applications of electricity as a power the rate question after all is of secondary importance for many power installations at a rate netting two cents are not near as satisfactory as a proper installation would be with a rate of three cents.

Small groups and individual motors will do more to make a satisfied cus-

tomer than anything else we have at hand. Of course, there are some exceptions, but they are few and far between. Up until two years ago the flour mill was one of the exceptions, but very satisfactory split drives have been installed and while the majority of the smaller mills will be handled satisfactorily by installing sepearate motors on the receiving elevator and on the cleaning machinery some of the larger mills will be split further.

Another exception is the silk weaving mill where groups of 18 looms, a warp and two or three winders may be run on a 15-horsepower motor at an economy over separate motors on each machine.

But these are the exception and the manufacturer who is running everything up to full capacity every minute of the day every day in the year is a curiosity, although power men are meeting men who think they are doing this every day. Another bug-bear is the elusive friction load. How many of us, when pointing out a saving to be made in friction, have been met with the argument, "Why that shaft takes no power, I can turn it by hand." It is well to meet this by saying, "Is that so? Well, let's see you turn it 250 times in a minute," that generally does the trick.

Even a one-horsepower friction waste that can be avoided, if allowed, 9 hours a day 25 days in the month, 12 months in the year, eats up the interest on $1,000 if current is sold at three cents per kilowatt-hour.

Not long ago a furniture concern that was running with a 40-horsepower motor approached a power salesman and quietly informed him that they were going to install a gas engine because their power bills were too high. Now, there is no use of side stepping this by saying a gas engine is unreliable, for with natural gas at 35 cents this man could afford to stand some interruption and still save money over what he was then doing and his current was not high for he had a rate of 2.5 cents per kilowatt-hour.

A test was run and it was found that in a 66-hour run he used 850 kilowatt-hours. A test with no machines at work, but with all machine belts on loose pulley gave 12 kilowatts which for 66 hours meant 792 kilowatt-hours wasted, which was 83 per cent of the whole. Of course, all of this could not be saved but a large part of it can and even though only 50 per cent of this means a material cut in the power expense. We often hear the excuse that to install a number of motors is too expensive for the manufacturer. Well, if he doesn't use electric power, he must use steam or an explosive type of engine and the price he will pay for either will buy a number of motors.

Again economy is the watchword of electric power and in every case we have certain limits that a man can pay for it. If he now is running with something else, some inducement in the way of savings must be made in order to influence the installation of motors. With this saving, which should warrant the investment taken from this present cost a certain sum is left available to pay for purchase of power. This installation that requires more current than another will mean a lower rate per kilowatt-hour. Of course, the lower the investment the less the saving need be to warrant the investment but unfortunately this does not work out in direct proportion and a happy medium can be struck.

A good way to do this is to lay out a plant with a motor on every machine, figure the total investment for motors, wiring and installation, then estimate the amount of current necessary to run such an installation so as to arrive at the cost of operation.

Then do the same things from a one motor standpoint. This should give you the lowest and highest current cost and the highest current cost and the highest and lowest investment. Then different arrangements of grouping can be laid out between these two extremes.

Again, if a series of layouts are presented the prospect can be given his choice of two or three, say the one above and below the salesman's recommendations and avoid the feeling that the customer is being handed something he has no voice in.

In the discussion Mr. Campbell, of the Union Gas & Electric Company, cited an instance of a gas engine driving looms in a textile mill, with a resulting output of only 65 per cent of the possible capacity of the looms. Electric motors were substituted on the group-drive system, and subsequent tests indicated that 90 per cent efficiency was being obtained. Mr. Campbell suggested that a careful lay-out of every plant to be electrified should be made by the sales department of the central station, and the location of every machine and motor indicated, so that the manager can see just how the equipment will be located.

H. B. Bixler, of Akron, called attention to the advantages of motor drive in rubber factories. In one factory using central station power in Akron there is a connected load of 1,800 kilowatts. In one department where calendars are used, the output of the machine was increased from 12 yards per minute to 40 yards per minute, by the substitution of electric looms. Other economies equally as important were effected. Mr. Bixler advocated the installation of trial motors in plants where there is some doubt as to the economies that will be effected, and has found this method very successful.

Harry Adams, a contractor, of Toledo, spoke of the co-operation which the contractors are extending to the Toledo central station in connection with the solicitation of power business. By working hand in hand much business which would be impossible to secure singly can be obtained.

J. C. Matthieu, of Dayton, said that he has found that individual-motor drive installations have low power-factor, and he asked if this had been the experience of other companies. He explained that the company tries to install synchronous motors wherever possible.

F. C. Morrison, of Newark, spoke of the co-operation with electric contractors in his town, and the successful results that are being obtained. One large installation was secured simply because the contractor who handled the motors agreed to make a trial installation, which, if not satisfactory, would be taken out.

Harry Adams, in this connection, stated that his company had installed 8,000 motors in Toledo, and are carrying all time accounts where it is necessary to make such. He referred to a Jovian scheme of co-operation whereby prospective users of power were invited to a lecture on electric drive by a representative of a Toledo central station, and the names of the prospects attending were divided up among the central-station salesmen and contractors.

Thomas F. Kelly referred to an offer made by the New Business Co-operations Committee last year to supply power experts to the small companies desiring their assistance when special propositions arise. D. L. Gaskill, in emphasizing the value of this service to the small companies, stated that usually the local managers know the prospects very well, and feel if they are unsuccessful that no new arguments can be advanced. That this is not true is indicated by the experience of the Greenville Company, which applied to the committee for a power expert from Cincinnati, who secured a 400-horsepower gravel-pit installation by bringing new ideas and arguments to the prospect, who already had been thoroughly canvassed by the local men.

An informal discussion on several topics of interest particularly to the small companies, was then begun. The subjects considered included "Electrical Advertising," "Wiring Old Houses," and "Methods of Selling Electric Heating Devices." In opening this discussion Mr. Gaskill thought that the amount of sign business obtainable in

a town of 10,000 inhabitants or less, is extremely limited. Merchants must do business on a smaller margin than in larger towns, and consequently cannot indulge in more elaborate forms of advertising. He thought that for the central-station company daily newspaper advertising is the best obtainable. Display rooms are also essential in a small town. Regarding house wiring he thought that central stations should be in a position to do this work, unless there was competition among electrical contractors; otherwise contractors would be in a position to charge prohibitive prices, which would discourage the business.

J. C. Morrison, of Newark, stated that his company has been successful in placing electric signs, and now have between 50 and 60 on the lines. The population of Newark is about 30,000. Flat rates are made for sign service, the signs being lighted from dusk to midnight. Regarding housewiring, he stated that the monthly payment plan has been very successful, and the average contracts obtained per month range between 70 and 75. The company secures a minimum schedule from the contractor for house wiring, and then quotes the prospect a rate of 10 per cent in excess of this, to cover cost of campaign. He added that during the past summer the company conducted an iron campaign, which was extremely successful. An ironing board was given free to each purchaser of an electric iron.

L. C. Anderson, of Middletown, stated that the Middletown Company operates a store in the best business section of the city. This, with attractive, timely window displays, and consistent newspaper advertising, has been found to be very successful. The monthly bills are also used to advertise various devices, and booklets are frequently sent out with the bills. A lady demonstrator, with domestic-science training, follows up this advertising with demonstrations of the appliances advertised, and in each case the appliance demonstrated is left for a two weeks' trial period. Mr. Anderson mentioned that this demonstrator is provided with a vehicle, and is thereby enabled to carry around a supply of devices. He stated that the profit on the electrical devices so sold has paid the expenses of the campaign.

J. E. North, of Springfield, stated that newspaper advertising has been found to be the most successful in his locality. Regarding sign business, there are at present 102 electric signs on the lines of the company, representing a connected load of 140 kilowatts. L. E. Trimbel, of Cincinnati, stated that 400 electric vacuum cleaners had been sold in a recent campaign, by giving an electric iron as a premium to each purchaser.

H. B. Bixler, of Akron, referred to an iron campaign lasting 3.5 months, during which 1,500 irons were sold by one man. He worked entirely on a commission basis, receiving 50 cents per iron.

F. C. Morrison explained that two local electrical contractors in Newark were making a flat rate of $2.87 for wiring for one outlet, and to each customer secured by the contractor the central station gave an electric iron. In response to questions concerning this rate, Mr. Morrison stated that the wiring was in conduit, and of approved type, and that the contractors themselves made this price. He thought that they anticipated additional business from customers who at first agree to have only one outlet.

In concluding the discussion, J. E. North stated that much additional business has been secured in Springfield by the electrical contractors and their employees because of the commission paid by the central station for all contracts obtained.

## Rate Reductions Proposed for Salt Lake City.

The officials of the Utah Light & Traction Company have offered to grant substantial reductions in the rates charged for electricity for lighting and power purposes in Salt Lake City in consideration of the City Commission granting them the permission to consolidate the franchise granted to the Merchants Light and Power Company with the franchise granted to the Utah Light and Railway Company, both of which have been acquired by the Utah Light & Traction Company.

The company offers to reduce the retail lighting rates from 10 cents to nine cents for the first 250 kilowatt-hours, and from nine cents to eight cents for the second 250 kilowatt-hours. It proposes also to reduce the price charged for flat-rate arc lamps from $5.55 per month, $6.67 per month, and $11.11 per month for 10-p. m. midnight, and all-night service respectively to $4, $5 and $8 per month. The company proposes to reduce the base rate on direct current from 11 cents to nine cents for the first 100 kilowatt-hours used per month, and the base rate on alternating current which is generally used in Salt Lake City from 10 cents per kilowatt-hour to eight cents per kilowatt-hour for the first 100 kilowatt-hours used per month. The commission and the company officials have agreed on the major portion of the proposed changes and the minor details are being worked out.

## Central-Station Survey in Salt Lake.

The Utah Light & Traction Company is engaged in making a connected-load survey of all of its residence, commercial and power customers. Fifteen men are engaged on the work and it is expected that it will be completed by January 1, 1915. Each customer is visited and all of his lights, appliances and motors are listed, particularly on power the nature of the work done by the particular machine is recorded, so that this information taken in conjunction with the customer's consumption over a period of a year will furnish a large amount of valuable information. A letter is mailed to the customer in advance of the visit of the canvasser stating the purpose of the visit and inviting the customer to make any suggestions that he or she may wish to with reference to the service.

In addition to securing first-hand information in regard to the customer's installation and prospects for additional business, the company is obtaining by means of this canvass many suggestions which will enable them to avoid friction and mistakes in the future. The canvasser carries a pad of inquiry slips and any questions from the customer in regard to irons, percolators, toasters, ranges, etc., are noted and are turned over to the new-business department for follow-up. In this way many leads are being secured which will undoubtedly result in a considerable increase in revenue due to the addition of appliances to the load.

The most frequent questions are in regard to the possibilities of electric cooking. A large proportion of the women appear to be much interested in the subject and many have expressed a determination to install an electric range in the spring as a result of the demonstrations they have seen in the company's Electric Shop, at the State Fair, and elsewhere.

The information obtained by the canvasser on the data cards is transcribed to a permanent customer's data card which will be used by the new-business department in connection with new-business campaigns which are contemplated in the near future.

## Distribution of Boston Edison Stock.

The Edison Electric Illuminating Company, of Boston, has 4,900 stockholders, the average holding being 42 shares. There are 41 stockholders who own 500 shares or more, with total holdings of 37,909 shares, or 18 per cent of the 204,729 shares outstanding. The largest shareholder is the estate of George Peabody, with 2,250 shares, having a present value of $526,500.

# Electrical Construction

## DETERMINATION OF HEIGHTS AND DISTANCES FOR THE LINE-CONSTRUCTION MAN.

By Allen N. Bancroft.

It is the intention to outline in this article a number of methods for determining heights and distances, that have been, and can be, effectively utilized by electrical line construction men. None of the methods is new insofar as the principle upon which it is based is concerned, and it is probable that all have been applied in many cases in line construction work. However, all of the methods have never, so far as the writer is aware, been gathered together and presented in a form that is readily available for the construction man. In nearly every case two or more methods for solving a given problem are presented. Usually one of these involves the use of instruments of one sort or another. In addition, methods are given for the solution of the same problems for which no instruments and only the simplest arithmetical operations are necessary.

Very frequently it is necessary to determine the height of some object that cannot conveniently be measured directly. The object may be a tree, a building, or some other obstruction, which the conductors on a pole line must clear. In such a case, the desideratum is to ascertain the height of a pole that will be required to carry the conductors over the obstacle with ample clearance. Another case that frequently arises is to determine the height of an unstepped pole, which is to be replaced. Several methods of securing this data are given in the following paragraphs.

It is desired to determine the height of a standing tree, shown in Fig. 1. When the sun is shining and the length of the shadows cast can be measured, this can be done by making measurements with a tape line and using a rod *R*, Fig. 1, for an index. The rod is driven into the ground and then the shadow that it casts and the shadow cast by the tree are measured. The equation that applies is derived from the proportion wherein

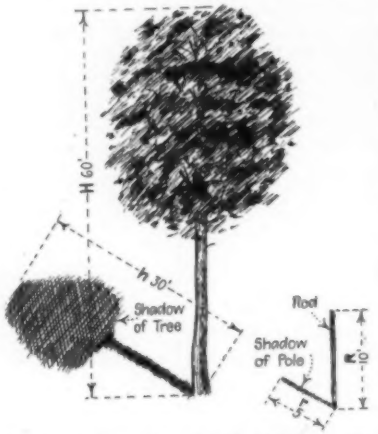



Fig. 1.—Determining the Height of an Object by Measuring Its Shadow.

$$H:h::R:r$$

wherein $H$ is the height of object being measured; $h$ is length of shadow cast by object being measured; $R$ is length of rod extending from ground; and $r$ is length of shadow cast by rod; all dimensions being in feet.

$$H=hR/r \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

*Example:* What is height of tree in Fig. 1? Distance rod extends from ground ($R$)=10 feet; length of shadow cast by rod ($r$)=5 feet; length of shadow cast by tree ($h$)=30 feet. Substitute in the formula (1):

$$H=30\times 10/5=60 \text{ feet.}$$

Height is 60 feet.

Another simple method that can be used for measuring the height of a standing object is suggested in Fig. 2. The observer walks a convenient distance, $L$, along level ground from the foot of the object. He then lies flat on his back on the ground as shown. His helper notes on a pole held vertically on the ground (the pole to rest against the observer's feet) the point where the line of vision of the reclining man intersects the pole. The distance, $P$, from the ground to this point of intersection is measured. Also the height of the man, $M$, from his feet to his eyes is measured. Using the notation given in Fig. 2, the following proportion will be true:

$$M:P::L:H$$

$$H=PL/M \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

*Example:* What is the height of the tree in Fig. 2? Distance from observer's eyes to foot of pole ($M$)=5 feet; distance from ground to point where line of vision crosses pole ($P$)=7 feet; distance from observer's eyes to foot of tree ($L$)=80 feet.

Substitute in the formula (2):

$$H=7\times 80/5=112 \text{ feet.}$$

Still another method of determining the height of a standing object, for which only two poles and a tape line are necessary, is suggested in Fig. 3. Two observers are required. Two poles, one of which may be short and the other long, are set vertically in the ground at locations that will be determined by conditions affecting the problem under consideration. The observer sights from the upper end of the short pole across the second pole, first to the top and then to the base of the obstruction. The assistant notes the points on the long pole, where

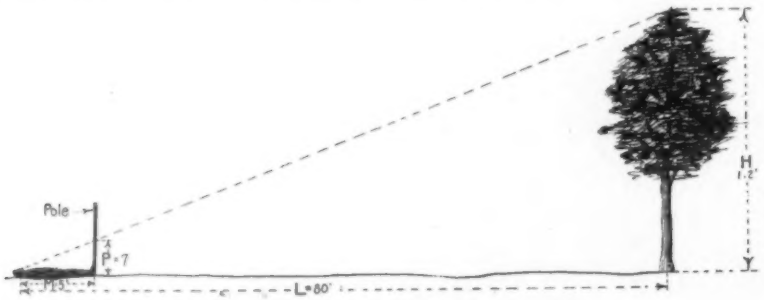



Fig. 2.—Another Method of Finding the Height.

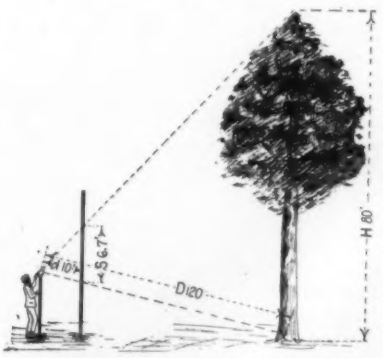



Fig. 3.—Another Method for Height.

these two lines of vision cross it, and measures the distance, $S$, between them. The distance, $D$, from the top of the short pole to the base of the tree and the distance from the top of the short pole to the long pole ($d$), both along the lower line of vision, are measured. Then the proportion will obtain:

$$d:D::S:H$$

$$H=DS/d \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

*Example:* What is the height of the tree in Fig. 3? Distance between points where lines of vision cross pole ($S$)=6.7 feet; distance between poles ($d$)=10 feet; distance between short pole and foot of tree ($D$)=110 feet.

Substitute in the formula (3):

$$H=110\times 6.7/10=73.7 \text{ feet.}$$

Probably the heights of objects can be determined more conveniently through the application of simple trigonometry than by the rules involving proportion that have been given in the preceding paragraphs. If the suggestions that will be outlined are followed anyone can determine heights by these trigonometric methods without having any particular knowledge of trigonometry. If he will merely follow the directions given he should have no difficulty.

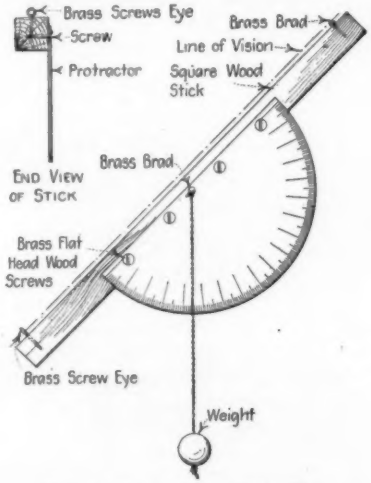



Fig. 4.—Home-Made Clinometer.

When using these trigonometric methods for determining the height of an object it is always necessary to measure the base angle at the observer's eye between the top of the object and the ground line. An instrument of some sort must be used for measuring this angle. For ordinary work, the home-made clinometer shown in Fig. 4 can be applied.

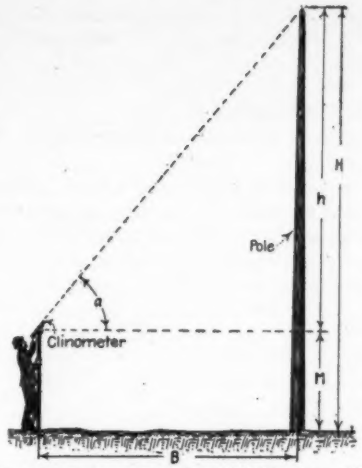



Fig. 6.—Determining the Height of an Object with the Clinometer.

The simple angle-measuring device shown in Fig. 4 is constructed by fastening to a square wooden rod, about 18 inches long, a protractor. For a temporary tool, a cardboard protractor, that can be purchased for a few cents at a drafting-tool supply house, or can be readily drawn by anyone on a piece of Bristol board, can be used. The cardboard should be given a couple of coats of shellac to protect it from dirt or moisture. For a permanent tool a metal protractor should be used. Sights are arranged on the square wooden stick. The forward sight consists of a brass brad. The rear sight is the smallest brass screw-eye that can be obtained. Each of these is inserted about one-fourth inch from an end of the stick. In placing these sights in the stick, the maker should be careful to so drive them that the imaginary line of vision as shown in Fig. 4, when it passes throught the center of the screw eye and the head of the brad, will lie exactly parallel with the diameter of the protractor. A piece of fine linen or silk fish line, having a metal weight or small plumb bob attached to its lower end, is tied loosely around a brad driven into the stick at the exact center of the protractor.

To read a base angle with this clinometer, the observer holds it in his left hand and shifts its position until his line of vision passes through the center of the rear sight and intersects the front sight and the top of the object, the height of which he wishes to determine. In sighting he uses only one eye and keeps the other one closed. When the clinometer is properly sighted he clamps the fish line with his thumb and first finger of his right hand into the position that it has now assumed on the index of the protractor, and brings the tool down to read it. The base angle will be indicated where the fish line lies against the scale of the protractor. By clamping the line against the protractor before taking it down, the line is retained in position so that an accurate reading can be made.

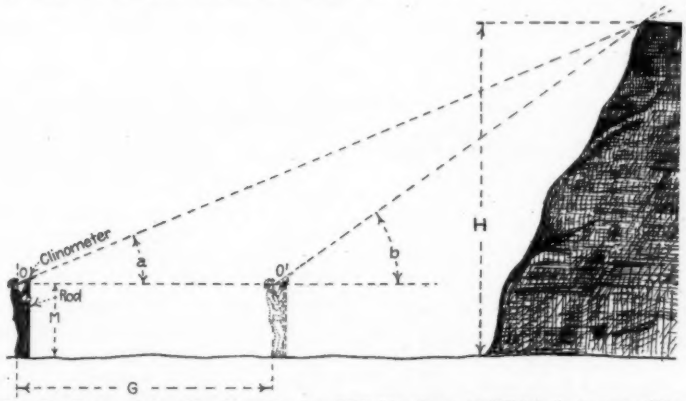



Fig. 7.—Determining the Height of a Cliff the Base of Which Is Inaccessible.

For more accurate work, a clinometer, such as that shown in Fig. 5, manufactured by some instrument company, can be used. Certain makes of these commercial clinometers are provided with scales of relatively large radii, and they have verniers and reading lenses whereby angles can be read to 10 minutes or one-sixth of a degree when necessary. The telescopic tubes can be extended for fine work, which gives the instrument an overall length of about 7

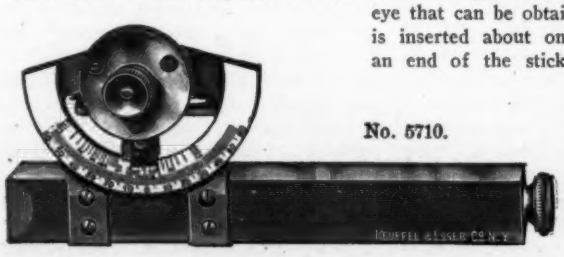



Fig. 5.—Commercial Clinometer.

Fig. 8.—The Telaheight.

inches. A worm-wheel adjustment is sometimes supplied for the vernier, which renders it possible to make very delicate adjustments. Supplementary scales, as shown in Fig. 5, are sometimes provided on the protractor, which give by direct reading the slope or grade of an inclination. In using the instrument it should be steadied on a rod which is pointed at one end, and of a height equal to the distance from the ground line to the observer's eyes. When making an observation the pointed end of the rod is thrust into the ground in front of the observer, and the clinometer is steadied on the top of the rod with the left hand, while the observer adjusts the vernier with his right. After one acquires a little skill, he can with this instrument readily ascertain the height of an obstruction to within 2 or 3 per cent. These results are considerably closer than those that can be obtained with the home-made clinometer of Fig. 4.

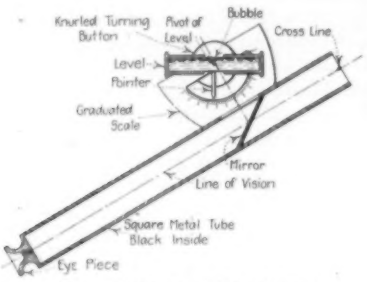



**Fig. 9.—Section of Telaheight.**

To measure the height of an object with a clinometer, when its base is accessible, the operations are as follows. The observer first measures (Fig. 6) some convenient distance, $B$, say 50 or 100 feet from the foot of the object. He then sights through the clinometer at the top of the object, and reads the base angle, $a$, from the protractor. Then the tangent, as taken from a table to be found in any engineer's handbook or other book of tables, multiplied by the base distance, $B$, plus the height of the observer, $M$, will give the height of the object.

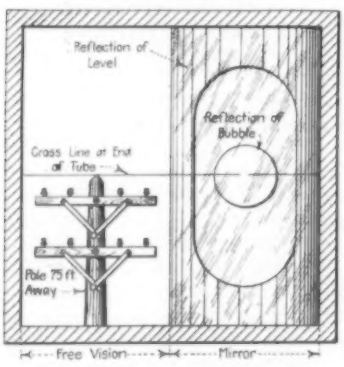



**Fig. 10.—Field of Instrument.**

*Example:* What is the height of the pole of Fig. 6? Distance between observer and foot of pole ($B$)=50 feet; angle $a$=36 degrees, and its tangent from the table is 0.727; distance from ground to observer's eye ($M$)=5.5 feet.

$$H = B \tan a + M = (50 \times .727) + 5.5 = 41.9 \text{ feet.}$$

It is sometimes necessary to measure the height of an object the base of which (for example, see Fig. 7) is not accessible. This can be easily done with a clinometer by measuring two angles (Fig. 7) $a$ and $b$, and the distance $G$ between the two points of observation, and the height, $M$. For such a case the following equation, the notation for which is illustrated in Fig. 7, applies:

$$H = \frac{G}{\cot a - \cot b} + M \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Wherein $H$=height of object being measured; *cot a* and *cot b*=respectively the values for the cotangents of these angles; and $M$=the height of the observer's eyes above the ground.

*Example:* What is the height of the cliff of Fig. 7? The distance $G$=200 feet; the angle $a$=18 degrees (cotangent, from table=3.08); angle $b$=24 degrees (cotangent, from table=2.25); height to observer's eyes ($M$)=5.5 feet. Substitute in the formula (5):

$$H = \frac{200}{3.08 - 2.25} + 5.5 = 246.5.$$

Therefore the cliff is 246.5 feet high.

To successfully determine height using the clinometers of Figs. 4 and 5 requires some skill, a little figuring and the use of a table of trigonometric tangents, and possibly cotangents. Experience has shown that although these operations and the equipment required are quite simple, it is frequently impossible to train the average line foreman or inspector so that he can apply them effectively. This condition created a demand for an instrument whereby the height of an object could be determined by direct reading, without its being necessary to use tables or make calculations. An instrument, Fig. 8, called the telaheight, was developed. It has been used very successfully, particularly by the larger public-service corporations. Many of these concerns have equipped all of their line foremen and inspectors with the device, and have found that they are saving money by so doing.

It having been found impossible to train the ordinary line foreman to the use of the clinometer, the procedure that was usual in determining the height of a pole, required to clear a tree or other obstruction, was usually to do the thing by guess-work. The foreman would, provided it was impossible to get to the top of the obstruction and therefore measure its height with a tape line, make as good a guess as he could. A large number of guesses had to be made because the property owners on fine residence streets declined to permit an able-bodied lineman to climb their trees with spurs. Sometimes the line foreman's guess was right, and sometimes it was wrong. Frequently in trying to economize he guessed too close, and the pole that was hauled out from the yard to the point of its installation would after having been set in the ground, be again taken out and hauled back to the yard to be replaced by a taller one. On the other hand, where the foreman wished to be perfectly safe he would put in a pole longer than was actually necessary. This was a source of considerable unnecessary expense, because each additional foot at the top of a pole 35 or 40 feet long costs a relatively large sum. The taller the pole is, the more each additional foot costs. These are the reasons why certain companies have eliminated the guess-work feature by equipping men with an instrument whereby the height of an obstruction can be accurately measured.

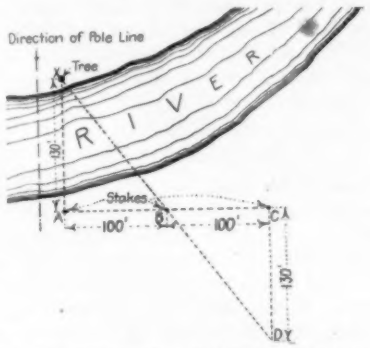



**Fig. 11.—Determining the Distance Across a Stream.**

In Fig. 9 is given a diagrammatic sectional drawing illustrating the principle upon which the telaheight operates. All of the instruments are calibrated for a base distance of 75 feet; that is, the observer must step off or measure, in every case, a horizontal distance of 75 feet from the base of the obstruction to the point where he will stand to make his observation. When making an observation the observer's eye should be 5 feet from the surface of the ground, it being assumed that it is level from where the observer

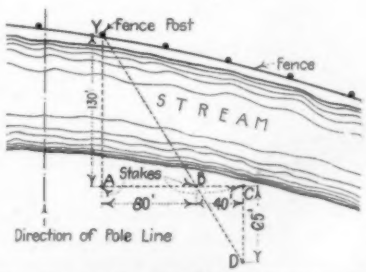



**Fig. 12.—Another Method of Obtaining the Distance Across a Stream.**

stands to the foot of the pole, because this 5 feet distance is considered in the calibration of the instrument. The scale on the instrument reads directly the distance between the surface of the ground and the top of the object at which the instrument is pointed.

In making a measurement the observer stations himself as shown in Fig. 6, making the distance *B* equal to 75 feet, and sights through the tube. He then tilts the instrument until the cross line in the tube and the hole in the eye-piece are in the line of vision with the top of the obstruction that is being measured. Then the level on the instrument is adjusted with the knurled knob until the reflection of the bubble in the level lies across the center of the cross sight. When this condition obtains the vision of the instrument will appear as shown in Fig. 10. Then the index on the vernier will indicate directly the height of the obstruction from the surface.

Where the clearance between two existing aerial objects is to be measured, two readings are made and one is subtracted from the other to obtain the clearance.

The principle of the instrument is illustrated in Figs. 9 and 10. The rear end of the tube is occupied by an eye-piece and the forward end by a cross line. The eye-piece and the cross line comprise the sights. Directly under the point where the level is pivoted a mirror set at an angle of 45 degrees extends half way across the tube as shown in Fig. 12. The reflection of the bubble is shown in this mirror and when the bubble is centered

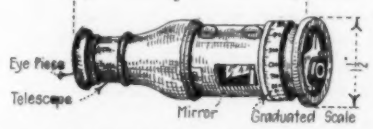



Fig. 13.—The Telemeter.

on the cross line of the mirror, the level is in a horizontal position. In looking through the tube, the observer sees the mirror with the reflection of the level in it across one-half (Fig. 10). The other half of the tube gives a clear unobstructed vision of the object being sighted, except the cross line extends across half way down. A set screw is provided whereby the turning button can be clamped in place, after the instrument has been sighted at the top of an object.

The standard pole settings in use in the United States are shown in Table I, and the length of any pole should be the height that it is to extend above the surface, plus the setting given in the table. The tabular values show the practice of the American Telephone and Telegraph Company, and the recommendations of the 1914 Committee on Overhead Line Construction of the National Electric Light Association. For example: if the height of an obstruction is 25 feet, 5 feet should be added for clearance; the pole setting for either electric light or telephone construction requires an additional 5.5 feet, making a 35-foot pole necessary for the location.

TABLE I.—DISTANCE POLES SHOULD BE SET IN THE GROUND.

| Pole Height in Feet. | Pole Setting in Feet. ‡N. E. L. A. | Pole Setting in Feet. †A. T. & T. |
|---|---|---|
| 22 | ... | 4.0 |
| 25 | 5.0 | 5.0 |
| 30 | 5.5 | 5.5 |
| 35 | 6.0 | 6.0 |
| 40 | 6.5 | 6.0 |
| 45 | 6.5 | 6.5 |
| 50 | 7.0 | 7.0 |
| 55 | 7.0 | 7.5 |
| 60 | 7.5 | 8.0 |
| 65 | 7.5 | 8.5 |
| 70 | 8.0 | 9.0 |
| 75 | 8.0 | 9.5 |

‡National Electric Light Association.
†American Telephone & Telegraph Company.

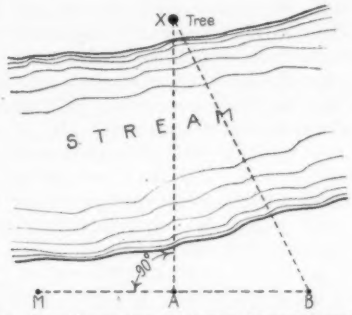



Fig. 14.—Measuring Distance Across Stream with Telemeter.

Often it is found necessary to measure the distance across some inaccessible space, as, for instance, the river shown in Fig. 11. The simplest method of doing this is to select some stationary point on the opposite side of the inaccessible space, as, for instance, a tree, *X*. Then drive a stake, *A*, on the near side of the space. From *A* measure the base on a line, *AC*, at right angles to *AX*. Half way between *A* and *C* drive another stake, *B*. Then measure down on a line, *CD*, to a point, as for instance, *D*, from which, when sighting across, *B* and *X* will be in the same straight line. Then the distance, *CD*, will be equal to the distance, *AX*. The values on Fig. 11 show the solution of one example.

Where there is not sufficient space to make the line, *CD*, of Fig. 11, long enough for sighting, the method of Fig. 12, which depends upon the same principle, can be used. In this method a stake, *B*, can be driven in the line *AC* at some point near *C*. Then by sighting to *Y* from points along *CD* the point *D* is found. This being done, the following proportion will be true:

$$AY:CD::AB:BC$$

Hence $AY=CD\times AB/BC$ .....(6)

*Example:* What is the distance across the stream of Fig. 12? $AB=80$ feet; $BC=40$ feet; and $CD=65$ feet. Substitute in formula (6):

$$AY=65\times 80/40=130 \text{ feet.}$$

An instrument that can be used for computing inaccessible distances as, for instance, between two distant buildings or across a stream, is the surveying telemeter shown in Fig. 13. This appliance fits in the pocket and inasmuch as it weighs only 10 ounces, and measures 4.5 inches long and 1.5 inches in diameter, it is very portable. Through its use horizontal distances can be measured to within 1 or 2 per cent. The range, or the distance between the two objects, is read in terms of units of a given base line on a graduated scale on the telemeter. It is evident therefore that it can be applied with equal success to either the metric or English systems of measurement. Distances of practically any magnitude can be accurately determined by using a base line of suitable length. The maximum distance that can be measured depends upon the length of the base line that can be employed, and upon the visibility of the objects the distance between which it is desired to obtain. The exterior appearance of the telemeter is shown in Fig. 13. It consists of two plain mirrors which are mounted on pivots, and so adjusted that they form an angle of 45 degrees in their initial positions. These mirrors serve as the index and horizon mirrors, as in the ordinary sextant. Both mirrors are mounted in a metal tube. At one end of this tube is a telescope; at the other end is a rotatable collar. By turning this collar the index mirror is moved in the azimuth. Its angular displacement is indicated on the graduated scale of the instrument. A small toothed wheel at the end of the instrument engages with the horizon mirror and is used for determining the direction of the base line. Distant objects are reflected in the mirror through a rectangular opening in the side of the tube. Through another opening at the front of the tube, the landscape can be seen over the horizon mirror. Shutters are provided to keep the dust out of the instrument.

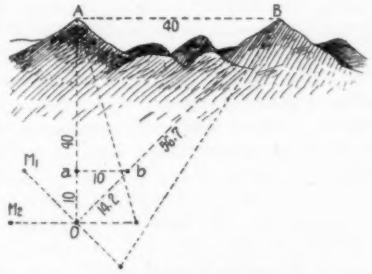



Fig. 15.—Determining the Distance Between Two Inaccessible Peaks.

In making a reading, this procedure is followed. The shutter is opened and the toothed wheel and the collar set to zero. The telemeter is held in the left hand with the rectangular opening to the right. The observer places the telescope to his

eye and will see the landscape to his right reflected in the mirror. Above the mirror he will see, by direct vision, a portion of the landscape in front of him superimposed.

Consider a specific example, Fig. 14. The distance, *AX*, across the river is to be determined. Select a tree, post, rock, or other stationary object, *X*, on the opposite bank of the river from the point, *A*, where a stake is driven. Some other stationary object on the near bank of the river is selected, or a stake is driven, at *M*. The observer takes his position at point *A*. He views *X* and *M* through the instrument, stepping around to change his position until the objects, *X* and *M* are superimposed as viewed in the instrument. By turning the small toothed wheel, the reflection of *X* and *M* can be brought into exact coincidence. A base line, *AB*, of some convenient distance is then measured, and the same objects (*X* and *M*) are viewed from *B*. However, coincidence is in this case effected by turning the graduated collar. Then the unknown distance, *AX*, is read on the scale in terms of the base line.

Where it is necessary to measure the distance between two inaccessible objects as, for example, the two mountain peaks of Fig. 15, the procedure is as follows. The observer first determines with the telemeter, as described in the preceding paragraph, the distance, *OA*, between his station and one of the points *A*. Then the distance, *OB*, is determined similarly. (Stakes $M_1$ and $M_2$ can be driven for sighting points for making these measurements.) Then some convenient proportion of *OA*, as *Oa*, and a similar proportion of *OB*, as *Ob*, is laid off. The distance *ab* is measured with the instrument or with a tape. Now the observer knows the following values:

*OA, OB, Ob,* and *ab.*

Then the proportion holds

$$AB:ab::OA:Oa::OB:Ob$$

$$AB=ab\times OA/Oa \text{ or } AB=ab\times OB/Ob$$

## An Electrical Key for the Use of Electrical Inspection Bureaus.

Washington Devereux, chief of the electrical department of the Philadelphia Underwriters' Association, has compiled a very practical and useful electrical key for the use of electrical inspection bureaus in advising electrical contractors, wiremen, etc., of corrections required so that the installation will conform to the National Electrical Code and municipal regulations. The key is arranged alphabetically so that it affords a ready means of communication from the inspection department having jurisdiction to the electrical contractor making the installation. A postal card is used bearing the name and location of the inspection bureau and a place for notation of the various letters of the alphabet used with reference to the key. This postal card should be sent by the inspector to the contractor immediately after inspection, indicating by the use of the key the conditions as found by the inspector. For instance, the letter "A" indicates as follows: "Rough concealed wiring O. K., switches and cutouts not placed; awaiting fixture application and notice for final inspection." The letter "G" would indicate "Building locked; advise when admission can be gained." The letter "S" would indicate "Conduit installed O. K.; wires not pulled in; advise when work is resumed." When the defects or deviations from the National Electrical Code or municipal regulations are such that none of these items cover the case, the key letter "H" is used, meaning "Work defective; will advise by mail." In the compilation there has been an effort made to cover by numbered items recommendations which experience has shown to be required by the inspection bureau to correct installations not in harmony with the Code and some municipal requirements. In other words, the items mentioned indicate the remedy for defects which are most likely to be found upon inspection of an electrical equipment.

In addition to wiring tables and diagrams showing the method of installing an all-conduit system, the method of grounding interior and surface conduits with several illustrations regarding the method of resuscitation from electric shock, is given.

Under the chairmanship of Mr. Devereux an electrical conference is held on the fourth Thursday of every month except June, July and August, at 226 South Eleventh Street, Philadelphia, at 8:00 p. m. The meeting rooms, apparatus and current necessary for practical demonstration tests, etc., are furnished free by the Philadelphia Electric Company. A special invitation is extended to foremen and wiremen, and all architects, engineers, manufacturers, jobbers, contractors and others interested in the electrical industry are invited to attend these meetings. A question box has been established, in charge of a special committee, for the gathering of detailed information relating to any question respecting electrical construction. A feature of the electrical key above described is a full-page announcement relating to the electrical conference.

A 20-year electric-light concession, with an option for 10 years additional, has been granted to Charles F. Fetter and others, to build and operate an electric plant in Nueva Gerona, Cuba, and to extend their wires all over the Isle of Pines. The machinery has been ordered and part of it has been shipped. Crude oil will be used for fuel.

## Among the Contractors.

J. W. Oberender has been elected secretary of the Oregon Electrical Contractors' Association.

A wiring contract for the Vorhees Building, Columbus, O., has been let to the Erner & Hopkins Electric Company.

E. A. Emery, electrical contractor, of Galva, Ill., has secured the contract for the electrical work in the new high school at Wethersfield, Ill. The work will be done in conduit.

Hurd & Davey have opened an electrical shop at 130 East Jackson Street, Mankato, Minn., and are prepared to do anything in the electrical construction or repairing line.

Louis J. Kemper, hitherto manager of the Electric Appliance Shop, Springfield, Mass., has opened a new electric shop at 315 Bridge Street, Springfield, where he will carry a line of Westinghouse, Hotpoint, Landers, Frary & Clark and other appliances. Mr. Kemper has had long experience in the marketing of electrical wares, having travelled for various firms, both in the United States and in Europe.

The McKeever Electrical Company, Columbus, O., has secured a contract for installing a feeder system at the Ohio Hospital for Criminal Insane, Lima, O. The system connects up the power house with the administration building, nurses building and other parts of the institution, and will cover a distance of 1,700 feet, through tunnels and conduits for the most part.

W. R. Hendry has announced that he has purchased the interests which J. F. NePage and V. S. McKenny formerly held in the concern of W. H. Hendry & Company, and has sold his interest in the firm of NePage, McKenny & Company to Messrs. NePage and McKenny. Mr. Hendry will continue to conduct his business as sales and installation engineer with high-tension electric specialties, and Messrs. NePage and McKenny will continue their business as electrical engineers and contractors, both lines to be conducted from the present offices in the Armour Building Seattle, Wash., but as entirely separate organizations.

Fifteen thousand employees of the Lynn works of the General Electric Company have been ordered to report for work on Monday, November 30, to be prepared to go back on full time. For several weeks the employees have worked part time only.

# Public Service Commissions

Conducted by William J. Norton

## CALIFORNIA.

**The San Diego Consolidated Gas and Electric Company** received authority to issue $250,000 face value of its 6-per-cent debenture bonds payable December 1, 1922, and $240,000 par value of its common capital stock. The bonds are to be sold so as to net the company not less than 93 per cent of their face value and accrued interest, and the stock is to be sold at not less than par.

## DISTRICT OF COLUMBIA.

**The Washington Gas Light Company** received authority to sell $300,000 face value of its bonds, previously issued and deposited as collateral security for the payment of the company's notes for money borrowed and used by it in betterments, improvements and acquisition of property; and, in addition, to issue $300,000 face value of its bonds, to reimburse the company for funds expended for the acquisition of property and for the construction, extension, and improvement of its plant and equipment. These bonds, amounting in all to $600,000, are a portion of the $5,200,000 issue of mortgage bonds of November 1, 1910, of this company.

## INDIANA.

**The Indianapolis Light and Heat Company** was ordered to reduce its rates for residence lighting service down to a level with those in effect by the Merchants Heat and Light Company. The order is temporary, pending the final decision in the lighting cases before the Commission.

## KANSAS.

**The Independent and the Bell Telephone Companies** of Kansas have been granted permission by the Commission to give free local and long-distance service incident to the collection of contributions for the Belgian relief fund.

**Thirteen Railroads** filed with the Public Utilities Commission November 20 applications for the establishing of a three-cent passenger rate. They allege that since 1907, when the two-cent fare agreement was made, the costs of operating and the cost of equipment have risen; they say, too, that the passengers are demanding better equipment and service, and that the rules of the Commission require them to operate on narrower and narrower margins. These increases in costs have continued while they have not received increased earnings, and unless the fare can be raised they must operate at a loss. The applications probably will not be filed until the new Commission comes in after January 1.

## NEW YORK—First District.

**New York Edison Company.** A petition has been received from the Merchants' Association of New York asking for a reduction in the rates of the New York Edison Company to large consumers. The Commission has been investigating the company's rates upon petition, which involved the reasonableness of the rates to small consumers. The immediate result of taking up the new investigation would be to delay a decision in the original proceedings, and the Commission has not as yet ordered a hearing in the matter.

## OHIO.

**Diamond Light Company, Court Case.** The suit brought by the City of Cincinnati against the Diamond Light Company, in which the company's right to do an electrical business without a franchise was attacked, has been decided in favor of the company by Judge Gorman. The company opened a block electric plant in the basement of the Gayety Theater Building several months ago, and on the protest of the Union Gas & Electric Company the city sued to enjoin it from doing business. Under the court's holding, however, it seems that the Diamond Light Company may proceed to do business without a franchise, and may even cross streets and alleys with its lines and conduits, provided the consent of the abutting property owners is obtained and the use of the street is not interfered with. The court declared that "it was never intended that a monopoly of the lighting business for commercial purposes should be given to any one individual, partnership or corporation; an abutting owner upon a street of a municipality has the right to use the streets and highways for any purpose he may deem proper, not inconsistent with the use of it as a street; he may lay water mains, or electric light conduits and wires, provided he does not interfere with the use of the street as a street, and may grant the right to connect his property with the property on the opposite side of the street to any person, partnership or corporation desiring to make the connection, providing it is done without affecting the rights of the municipality in the street."

**Cleveland Rate Case.** A decision is expected in the very near future in the Cleveland rate case that is now pending before the Ohio Utilities Commission, and the decision of the gas and electric committee of the council on the Columbus rate case is being postponed awaiting the decision of the Cleveland case by the Commission. In the Cleveland case an attempt is made to enjoin the municipal plant from selling current for 3.5 cents per kilowatt-hour, on the ground that the current cannot be produced for that amount.

## PENNSYLVANIA.

**New Castle Electric Company.** The contract between the New Castle Electric Company and the borough of South New Castle has been approved by the Commission. The contract contains the provision that there shall be no tax on the poles used in connection with street lighting.

**Merger.** The Commission approved the application of the Panther Valley Electric Light, Heat and Power Company and the Coaldale Electric Company on an agreement of merger.

## Union Gas and Electric Company Rates.

A report on electric rates of the Union Gas and Eleceric Company, Cincinnati, Ohio, for the purpose of a ten-year rate ordinance, has been submitted to the Cincinnati City Council by Arthur C. King, expert for the city. Mr. King assisted City Electrician Ray Palmer in the investigation of the Commonwealth Edison electric rates in Chicago.

An appraisal was made of the property used and useful for furnishing service in Cincinnati, treating it as under unified ownership. The reproduction cost new was found to be $7,952,893.79. The existing depreciation was fixed at $1,104,133.31, giving a present value of $6,848,760.38. The income accounts for the 12 months ending June 30, 1914, were examined and

adjusted, the final figure for Cincinnati business being $2,023,835.61. The expenses were treated in a similar manner to income, the amount including miscellaneous deduction from income being $840,969.91. The net earnings as shown by these figures are $1,182,865.70

Deducting depreciation reserve and return on investment from the adjusted net earnings, the maximum excess revenue, that could be devoted to rate reductions is $330,709.22, approximately 19 per cent of the total income exclusive of municipal lighting, which is being furnished under a ten-year contract. Allowing for contingencies, which may not have been provided for in the above, it is estimated that a reduction of 17.5 per cent may be made.

The cost of paving is calculated in the same manner as in the Commonwealth Edison report.

The overhead charges are estimated as follows: engineering and architect's fees 5 per cent; taxes, fire and liability insurance during construction 1 per cent; legal, organization, contingent and miscellaneous expense 4.5 per cent; total, 10.5 per cent. Assuming that it would require approximately two years for the construction of the plant and system, an allowance of 6 per cent on the total 110.5 per cent of the base cost is made for interest during construction. The total expense, or 17.13 per cent, was added only to construction items, which include buildings, power plant and substation equipment, and overhead and underground distribution system. Ten per cent was added to the cost of pavement; 12 per cent to land necessarily purchased in advance; and 5 per cent in the case of meters, arc lamps, tungsten fixtures, horses, wagons, etc. The overhead expense on the entire property as determined on this basis amounts to 15.75 per cent of the base cost.

The amount allowed for working capital is $241,673, which is about 12 per cent of gross income.

No allowance is included for intangible values. The different theories for estimating going value are considered and the discussion of the going value of the property is based on the theory approved by the New York Court in the Kings County lighting rate case.

The amount allowed as a deduction from net earnings to offset future depreciation is $284,921.82 which is 3.58 per cent of the cost of the property including real estate, or 3.80 per cent of the cost of the property excluding real estate. The accompanying table is used in allowing for depreciation.

The report states that the rulings of various public service commissions have established 8 per cent as a fair rate of return in electric cases and that considering all factors bearing on the case, it seems fair to fix 8 per cent as the allowance in this instance.

DEPRECIATION TABLE.

| | Years of Life | Per cent Net Salvage | Per cent Depreciation |
|---|---|---|---|
| Buildings: | | | |
| Generating plant... | 60 | 0 | 1.67 |
| Substation ..... | 50-60 | 0 | 2.00-1.67 |
| Office ..... | 60-75 | 0 | 1.67-1.33 |
| Miscellaneous ..... | 40-60 | 0 | 2.50-1.67 |
| Generating Plant: | | | |
| Stacks ..... | 30 | 0 | 3.33 |
| Boilers, etc. ..... | 20 | 4.0 | 4.80 |
| Generating units .. | 20 | 5.0 | 4.75 |
| Electrical equipment ..... | 20 | 10.0 | 4.50 |
| Piping and auxiliary equipment ..... | 20 | 6.0 | 4.70 |
| Substations: | | | |
| Electrical equipment ..... | 20 | 10.0 | 4.50 |
| Storage batteries.. | 20 | 17.0 | 4.15 |
| Underground System: | | | |
| Conduit, fiber and iron pipe ..... | 28 | 0 | 3.57 |
| Manholes and tile conduit ..... | 60 | 0 | 1.67 |
| Edison tube ..... | 28 | 10.4 | 3.20 |
| Cable ..... | 30 | 36.2 | 2.13 |
| Services ..... | 25 | 15.0 | 3.40 |
| Overhead System: | | | |
| Poles and pole-line equipment ..... | 20 | 12.0 | 4.40 |
| Wire ..... | 16 | 40.2 | 3.74 |
| Services ..... | 16 | 24.7 | 4.71 |
| Line transformers.. | 20 | 10.0 | 4.50 |
| Miscellaneous: | | | |
| Customers' meters. | 18 | 9.4 | 5.03 |
| Arc lamps ..... | 16 | 10.0 | 5.63 |
| Tungsten fixtures.. | 8 | 0 | 12.50 |
| Transportation equipment ..... | 7 | 5.0 | 13.57 |
| Office furniture and fixtures ..... | 10 | 0 | 10.00 |
| Tools, etc. ..... | 8 | 0 | 12.05 |

### Classification of Rates.

The discussion of the proper differentiation in rates, in part, as follows: "While the establishment of a classification is in practice determined to a certain extent by expediency, each class should have well defined characteristics which warrant its separation from others, and the rate for that class should have as close a relation as possible to the cost of serving the class. In serving any class of customers, there will be some who are served at a loss, but the class as a whole must return a profit to the company. This is particularly true in the case of the small retail consumer. It is also evident that any concessions which may be made to those customers who can afford to furnish their own service, in order to build up the business and improve conditions of operation, should impose no additional burden on other consumers, particularly those compelled to pay the maximum rate.

"In a few rate investigations an approximate apportionment of the investment, as well as expense between different classes of service has been attempted. These cases have generally been confined to the smaller cities with little diversification of business.

"The proper distribution of investment requires among other data a knowledge of the following factors: ratio of maximum demand to connected load and to average load for each class of business; time of day and of the year when the maximum demand occurs; diversity between consumers of each class and between different classes; diversity between different portions of the distribution system, as for example, between different substations, different feeders from the same substation, different transformers on the same feeder and different consumers on the same transformer.

"In this instance sufficient data are not available to render either the apportionment of investment or expense practicable. The general scheme of rates at present in force is in line with the generally accepted theory of electric rates and an adjustment of the maximum rate made on a proportionate basis would be equitable."

## Radio-Controlled Torpedo Boat.

It is reported that demonstrations of the remarkable radio-operated torpedo boat invented by John Hayes Hammond, Jr., at Gloucester, Mass., are being made in the presence of naval officers of the United States with a view to the acquisition of the patents by the Government. Mr. Hammond has secured more than 100 patents, among which is one covering the design of a wireless-steered torpedo with a capacity of 4,000 pounds of explosive, which it is claimed can be controlled at a distance of several miles. The radio torpedo boat has been controlled a distance of 28 miles from the inventor's wireless station, it is claimed.

The tests are being conducted in secret, only the interested parties being present. The government radio officials have been considering the matter for some time, and it is said representatives of four European governments have inspected the apparatus in Mr. Hammond's laboratory. In case the United States does not see fit to acquire the rights other nations will have opportunity to bid for them, according to reports.

## Jovian Electrical League of Southern California.

At a meeting of the Jovian Electrical League of Southern California, held at Los Angeles on November 18, Edwin H. Widney, a prominent attorney of Los Angeles talked on our "Trade Relations with South America." He stated that Europe controls the mercantile and banking business there, and deplored our lack of knowledge of the languages, resources and customs of our Latin neighbors. It is his opinon that the commercial salvation of this country lies in South America.

# Electrical Engineering Problems.

By R. G. Hudson and W. V. Lyon.

## DIRECT CURRENTS.

**Problem 12.**

The external characteristic of a 115-volt, 10-kilowatt shunt generator is shown in Fig. 12. The resistance of the shunt field is 40 ohms, and the resistance of the armature is 0.06 ohm.

Find (*a*) the armature current, field current and line current respectively at full load; (*b*) same at no load; (*c*) armature voltage at full load and no load respectively, and (*d*) explain why the terminal voltage of a shunt generator decreases as the load increases.

This problem illustrates the properties of a shunt generator.

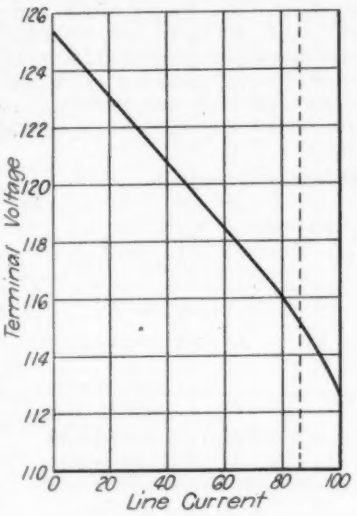



Fig. 12.

### SOLUTION OF PROBLEM 12.

In the dynamos discussed in the three preceding problems, the armature flux was produced by electromagnets energized from some source external to the machine. In the shunt generator connected as shown in Fig. 13, part of the armature current circulates through the field winding and the machine is said to be "self-excited."

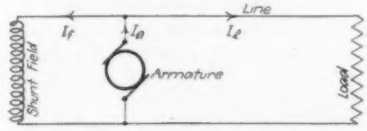



Fig. 13.

**Answer to Question a.**

Since the terminal voltage is 115 volts when the power output is 10 kilowatts, the line current ($I_l$) at full-load is given by [19],

$$I_l = 10{,}000/115 = 86.9 \text{ amperes.}$$

Since the field resistance is 40 ohms and the voltage impressed upon it at full load is 115 volts, the field current ($I_f$) is given by [6],

$$I_f = 115/40 = 2.87 \text{ amperes.}$$

Both the field and the line current come from the armature. Hence the armature current ($I_a$) is given by [13],

$$I_a = 86.9 + 2.87$$
$$= 89.8 \text{ amperes.}$$

**Answer to Question b.**

At no load the power output is zero, and the line current is therefore zero at no load.

The field current at no load is obtained as before, noting that the terminal voltage (Fig. 12) at no load is 125.3 volts, by [6],

$$I_f = 125.3/40 = 3.13 \text{ amperes.}$$

The armature current, as before, is found by [13],

$$I_a = 3.13 + 0 = 3.13 \text{ amperes.}$$

**Answer to Question c.**

The armature voltage ($E_a$) at full load is greater than the terminal voltage ($V_t$) at full load by the resistance voltage ($I_a R_a$). Hence, by [3],

$$E_a = 115 + 89.8 \times 0.06$$
$$= 115 + 5.4 = 120.4 \text{ volts.}$$

Similarly the armature voltage ($E_a$) at no load is given by [3],

$$E_a = 125.3 + 3.13 \times 0.06$$
$$= 125.3 + 0.2 = 125.5 \text{ volts.}$$

**Answer to Question d.**

Assuming, first, that the armature voltage of a shunt generator is constant and independent of the load, the terminal voltage is given by [3],

$$V_t = E_a - I_a R_a$$

It follows from this analysis that as ($I_a$) increases ($V_t$) must decrease. It should be noted, however, that for a constant field resistance the field current is proportional to the terminal voltage. Therefore a decrease in the terminal voltage is followed by a decrease [6] in the field current, a decrease [25] in armature flux and a decrease [29] in armature voltage. Increase of load then decreases the terminal voltage more than that indicated in the first assumption, since the armature voltage also decreases because of the decreasing field current.

In Problem 8 it was shown that a magnetic flux is produced by a current flowing in a wire and that the flux was increased by winding the current-carrying wire on iron. The armature winding of a dynamo when carrying a current produces a flux which varies with the load, the general direction of the flux being perpendicular to the flux produced by the field winding. The flux in a loaded armature then comes from two distinct sources; the ampere-turns on the field and the ampere-turns on the armature. The magnetomotive force due to the ampere-turns on the armature is called the *armature reaction*. The normal flux through the armature due to the field magnetomotive force is increased or decreased by the armature reaction, depending upon their relative directions. Under loaded conditions, part of the armature reaction acts in opposition to the field magnetomotive force, and since the armature reaction increases with the load, the armature flux is accordingly decreased as the load increases. The armature voltage is then further reduced [29] by the effect of armature reaction. In a shunt generator, then, the terminal voltage decreases as the load increases,

## ALTERNATING CURRENTS.

**Problem 62.**

The name plate of a transformer gives the following information: "100 kilovolt-amperes, 13,200, 6,600 :220, 110 volts, 60 cycles." Both the high- and low-tension windings are divided into two equal parts which may be connected in series or in parallel. With both windings connected in series the percentage distribution of the losses at full load is: copper loss, 1.0 per cent; eddy-current loss, 0.24 per cent; hysteresis loss, 0.78 per cent. (*a*) What different ratios of transformation can be obtained with this transformer? (*b*) With both high- and low-tension windings in series the transformer receives power from a 6,600-volt, 25-cycle circuit. What is the eddy-current loss? What is the hysteresis loss? On the basis of the same total losses what should be the full-load rating?

(1) because of the increased resistance voltage; (2) because of the decreased field current, and (3) because of the further decrease of armature flux due to armature reaction. All of these effects may be compensated for by decreasing the resistance of the shunt field as the load increases. This is accomplished by placing an adjustable resistance box in series with the shunt field.

## SOLUTION OF PROBLEM 62.

Transformers which are used to distribute electric energy at low voltage for power and lighting purposes frequently have their high and low-tension windings divided into equal parts. In this way three different ratios of transformation are possible, and the transformer may be connected to receive its power from either of two high-tension circuits, the voltage of one of which is double that of the other. If two windings on the same iron core are connected in series the total number of turns is equal to the sum of the number in each winding. If the two windings have the same number of turns and are connected in parallel the total number of turns is equal to the number in each winding. In the first case the total resistance is equal to the sum of the resistances of the windings, while in the second case the total resistance is one-half of the resistance of either winding.

If the high-tension windings are connected in series the transformer can receive its power at full voltage, which, in this case is 13,200 volts. The voltage across each coil of the high-tension winding would be one-half of this, or 6,600 volts. Thus if the windings are connected in parallel they should receive power from 6,600 volts. This is the meaning of the double-voltage rating.

The ratio of transformation from one of the high-tension windings to one of the low-tension windings is, in this case, 6,600 to 110 volts. If ($N_1$) and ($N_2$) respectively represent the number of turns in *each* part of the high and low-tension windings,

$$N_1/N_2=6,600/110=60$$

**Answer to Question a.**

If both of the windings are connected in series the ratio of transformation is by [36a],

$$E_1/E_2=2N_1/2N_2$$
$$=13,200/220$$
$$=60.$$

If both of the windings are connected in parallel the ratio of transformation is

$$E_1/E_2=N_1/N_2$$
$$=6,600/110$$
$$=60.$$

Therefore, if both windings are connected in the same way the ratios are the same.

If the high-tension windings are connected in series and the low-tension windings are connected in parallel the ratio is

$$E_1/E_2=2N_1/N_2$$
$$=13,200/110$$
$$=120.$$

If the high-tension windings are connected in parallel and the low-tension windings are connected in series the ratio is

$$E_1/E_2=N_1/2N_2$$
$$=6,600/220$$
$$=30.$$

Care must be observed in making these connections. The manufacturing companies supply a diagram with the transformer showing how they should be made. In want of such a diagram it will be necessary to make tests with a voltmeter to determine how the connections should be made.

**Answer to Question b.**

| | | |
|---|---|---|
| Copper loss= | 1.00 | per cent |
| Eddy current loss= | 0.24 | " " |
| Hysteresis loss= | 0.78 | " " |
| Total loss= | 2.02 | " " |
| Output= | 97.98 | " " |
| Input= | 100.00 | " " |

$$\text{Input}=100,000/0.9798$$
$$=102,040 \text{ watts}$$
$$\text{Copper loss}=0.01\times102,040$$
$$=1,020 \text{ watts}$$
$$\text{Eddy current loss}=0.0024\times102,000$$
$$=245 \text{ watts}$$
$$\text{Hysteresis loss}=0.0078\times102,000$$
$$=795 \text{ watts.}$$

The hysteresis and eddy-current losses are determined by the applied pressure and frequency, while the copper loss is determined by the current. The applied pressure is 6,600 volts, which is one-half of the rated value when the high-tension windings are connected in series. The frequency is 25 cycles instead of the rated value of 60 cycles.

The core losses depend upon the frequency and the maximum flux density (see Problem 60). By [37a],

$$\phi_m=E/4.44Nf10^{-8}$$

Let ($\phi'_m$) be the maximum flux density for the new condition.

$$\frac{\phi'_m}{\phi_m}=\frac{6,600/25}{13,200/60}$$

This is also the ratio of the maximum flux densities.

Let ($P'_e$) represent the eddy-current loss for the second condition.

By [40a]. (See Problem 60.)

$$\frac{P'_e}{245}=\left(\frac{25}{60}\right)^2\times\left(\frac{6,600/25}{13,200/60}\right)^2$$

$$P'_e=\left(\frac{6,600}{13,200}\right)^2\times245=61 \text{ watts.}$$

Observe that the eddy-current loss varies as the square of the applied pressure.

Let ($P'_h$) represent the hysteresis loss for the second condition.

By [40a]. (See Problem 60.)

$$\frac{P'_h}{795}=\left(\frac{25}{60}\right)\times\left(\frac{6,600/25}{13,200/60}\right)^{1.6}$$

$$=25/60\times1.49$$
$$=0.62$$
$$P'_h=0.62\times795$$
$$=493 \text{ watts.}$$

The total core loss for the second condition is 61+493=554 watts.

The total loss at the rated voltage and frequency is

1,020+245+795=2,060 watts.

The core losses for the second condition are 554 watts. This leaves 2,060—554 =1,506 watts as the allowable copper loss when the applied pressure is 6,600 volts at 25 cycles. The rated current is 100,000÷ 13,200=7.57 amperes.

Let ($I'$) be the allowable full-load current for the second condition. The copper loss varies as the square of the current.

$$(I')^2/7.57^2=1,506/1,020$$
$$=1.476$$
$$(I')^2=1.476\times(7.57)^2$$
$$I'=\sqrt{1.476}\times7.57$$
$$=1.215\times7.57$$
$$=9.2 \text{ amperes.}$$

The allowable current in the high-tension winding is 9.2 amperes, or about 22 per cent greater than before, but the applied pressure is only one-half of the rated value.

The rating of the transformer in volt-amperes is the product of the applied pressure and the rated full-load current and in this case is 6,600×9.2=60,700 volt-amperes.

The full-load rating should be 60.7 kilovolt-amperes when the applied pressure is 6,600 volts at 25 cycles.

In practice the division of the core losses between hysteresis and eddy-current loss would most frequently not be known. In that case a rough approximation can be made by assuming that the core loss varies as the first power of the frequency and as the square of the flux density. Let $P'_e$ represent the core loss for the second condition. Then, if we apply this approximation,

$$\frac{P'_e}{1,040}=\left(\frac{25}{60}\right)\times\left(\frac{6,600/25}{13,200/60}\right)^2$$
$$=0.60$$
$$P'_e=624 \text{ watts.}$$

Compare this with the correct value of 554 watts. The error is only about 13 per cent.

The error in the rating is much less than this. The allowable copper loss is

2,060—624=1,436 watts.

As before let ($I'$) represent the allowable full-load current for the second case. Then

$$(I')^2/7.57^2=1,436/1,020$$
$$=1.41$$
$$I'=\sqrt{1.41}\times7.57$$
$$=1.19\times7.57$$
$$=8.98 \text{ amperes.}$$

The full-load kilovolt-amperes equals

6,600×8.98=59.2.

This value is but 2.5 per cent less than the correct value of 60.7 kilovolt-amperes previously found.

**DIRECT CURRENTS.**

**Problem 13.**

The magnetization curve at 1200 revolutions per minute of a 230-volt, 30-kilowatt shunt generator is shown in Fig. 14. The shunt field has 1000 turns. The resistance of the armature between brushes is 0.08 ohm and at full load the demagnetizing magnetomotive force of the armature is 600 ampere-turns.

Find (*a*) the resistance of the shunt field circuit which gives a terminal voltage of 230 volts at no load; (*b*) the critical resistance of the shunt field circuit; (*c*) the resistance of the shunt field circuit which gives a terminal voltage of 230 volts at full load; and (*d*) the terminal voltage at no load and at 1000 revolutions per minute with the shunt field resistance obtained in Question (*a*).

This problem illustrates the effect of shunt field resistance, armature reaction and speed upon the terminal voltage of a shunt generator.

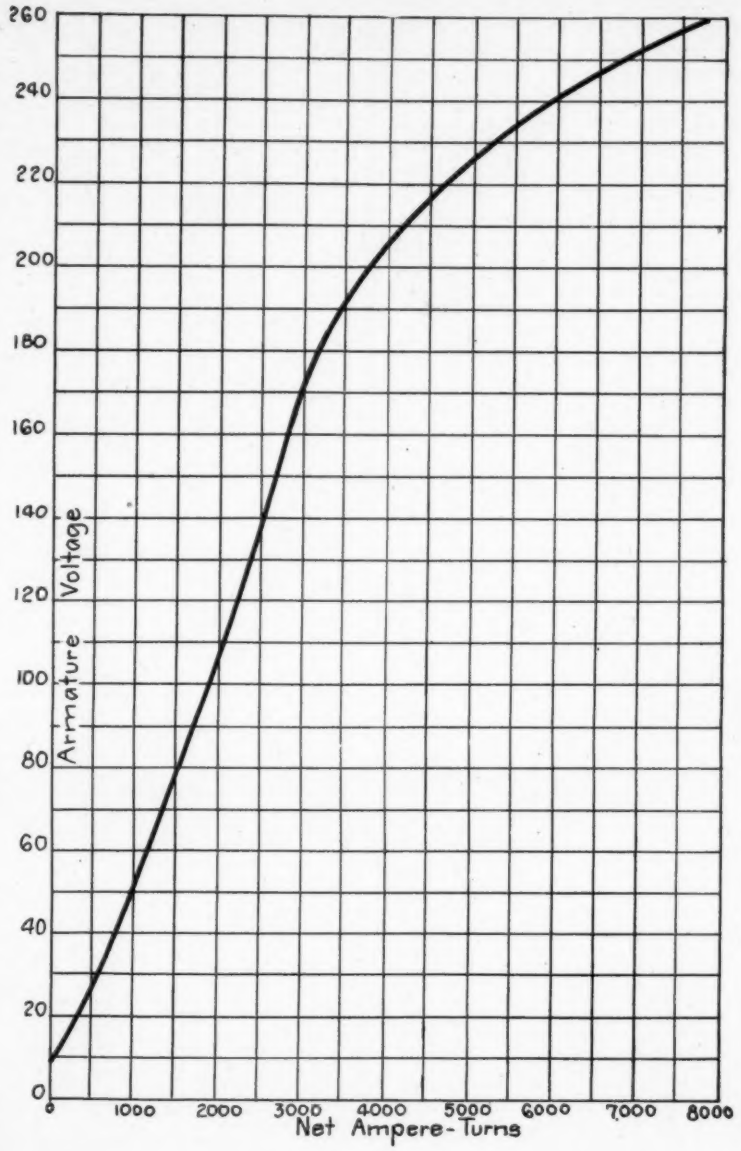



Fig. 14.

**ALTERNATING CURRENTS.**

**Problem 63.**

A laminated magnetic core has a mean length of 41.2 inches and a gross cross-section 3.50 by 3.46 inches. Twelve per cent of the gross cross-section is occupied by insulating varnish. It is desired to wind this core with a coil of copper wire which may be safely connected across a 230-volt, 60-cycle circuit. The number of turns in this winding is to be such that the core loss will be 150 watts at the stated voltage. The size of the wire is to be such that the resistance of the winding will be 0.21 ohm. Use the magnetic data given in problem 61.

(*a*) What current and power would this coil take if connected across a large 10-volt storage battery? (*b*) What current and power would this coil take if connected across a 230-volt, 60-cycle circuit? (*c*) If an air gap 0.24 inch long is cut in the magnetic core, what current and power will the coil take when connected across a 220-volt, 60-cycle circuit?

This problem illustrates the effect of an air gap in a magnetic core.

Solutions of the above problems and two new problems will be printed in the next issue.

## Accident Prevention.

The American minister to Uruguay, South America, reports that a law was recently passed in that country to prevent accidents to employees in industrial establishments or engaged in industrial work. The law applies to factories, mines, quarries, or any other places in which the work involves danger to the life or health of workmen. The rules concerning the installation of machinery and the protection or screening of dangerous parts of machinery are of a general character.

## Empire State Meeting.

A meeting of the Empire State Gas and Electric Association will be held in Albany, N. Y., on the afternoon of December 10 and on December 11. There will be a discussion of the handling of complaints.

# Questions and Answers.

**All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.**

### Questions.

No. 240.—Life of Gas-Filled Tungsten Lamps.—What is the longest life record as yet attained on test or in service with the new nitrogen-filled tungsten lamps?—P. C. U., Springfield, O.

No. 249.—Automatic Open-Circuit Tester.—In some fire-alarm systems of the open-circuit type I am told that some device is provided for automatically testing the lines from time to time to see that they are in working condition. How is this done? Has it been used to check the condition of telephone lines?—D. K. Y., Ogden, Utah.

No. 251.—Life of Flashing Sign Lamps.—In the case of a flashing sign equipped with tungsten lamps is the life of these lamps shortened due to the continual flashing?—H. D. V., Lafayette, Ind.

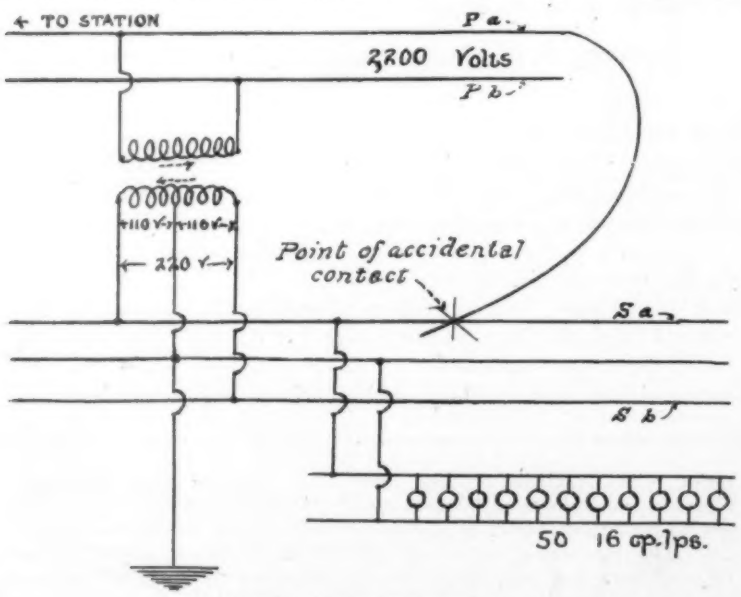
No. 253.—Cable Pot Heads.—Is it customary to require pot heads or equivalent devices on lead-covered cables for voltages below 500?—C. R. H., Pittsburgh, Pa.

No. 254.—Ground Problem.—A certain transformer supplying a dwelling and residential district, the load consisting chiefly of lamps for indoor illumination, is supplied from a 2,200-volt circuit carried on top of the cross-arm of each pole; the secondary wires are strung on separate cross-arms, placed four feet below and run parallel to the primaries. The secondary system is three-wire, 220-110 volts, with neutral permanently grounded at same point, near the transformer. At the moment of an accident of the nature shown by the accompanying diagram, the case where the primary wire marked *Pa* would become detached, or broken, and fall across the secondary marked *Sa*, would the high-tension current rush to ground through that half of the secondary coil, by overcoming its reactance, or would it tend to follow the path of low resistance, approximately 4 ohms (resistance of the load at time of contact), to ground through the neutral?—J. H. M., Quebec, Canada.

### Answer.

No. 248.—Misuse of "Electric."—Cases have frequently come to my notice of the evidently intentional misuse of the word "electric," such as electric soap, electric razor, electric shoe polish, etc. Now while such use of the word is mostly harmless and is readily detected by electrical men as an attempted flattery, in many instances it is palpable deception with intent to defraud the uninitiated and in too many cases not only does mislead buyers but gives a bad repute to things truly electric. Has this matter ever been taken up by any national or local electrical society with the aim of securing legislation to prohibit misuse of the word?—A. E., Chicago, Ill.

While there has been a decided tendency in recent years towards insisting upon legitimate advertising and avoiding all misbranding of goods or improper descriptions of the same, any attempt to limit the use of the word "electric" in the way suggested by A. E. would encounter the obstacle that this term is no longer used merely in its technical sense. Our dictionaries give it a number of shades of secondary meanings, as for example: "full of fire, spirit, or passion, and capable of communicating it to others; electrifying (*i. e.*, suddenly and violently exciting, especially by something highly delightful or inspiriting); thrilling." Indeed, the word had acquired these meanings long before electricity entered the service of man on any extensive scale, hence it is too late now for us to be justified in any endeavor to suppress the non-technical significance of the term which antedates the incandescent lamp, the dynamo, the telephone and even the telegraph. However, our various electrical organizations undoubtedly could render an important service both to the allied industries and to the public at large by taking a decided and effective stand against all misbranding of products and all misleading advertisements. Such a movement might include among its targets such flagrant offenders as use the term electric purely with the intent of defrauding the public; but any endeavor to restrict the use of the word now to the technical meanings which have been brought uppermost by the developments of the last thirty-five years would, I believe, be futile in view of the non-technical significance which the adjective "electric" had previously acquired.—Albert Scheible, Chicago, Ill.




No. 254.—Ground Problem.

## Thawing Frozen Water Pipes.

With the winter season at hand, the problem of thawing frozen water pipes comes again to the fore, and electrical apparatus suitable for this application will again be in demand. Convenient methods of thawing have been given in previous years in the Electrical Review and Western Electrician.

A reader has come forward with a novel method which was utilized during the first cold snap of the present season. Upon returning to his home at night after freezing weather, the water pipes in the bathroom were found to be frozen, due to the room being inadequately heated. There was no opportunity of securing additional apparatus, so the electric iron was clamped in position with its bottom surface pressed against the pipe. The current was then turned on. Five hundred watts does not make an instantaneous impression upon a pipeful of ice, but in course of time there was enough melted for the water to flow through and that settled the matter.

This is indeed a homely application of an electrical device, but one that proved a great convenience. There was no danger of overheating the iron under such conditions.

## Western Economic Society Conference on Railway Problems.

The eighth conference of the Western Economic Society was held at the Hotel Sherman, Chicago, on November 13 and 14. The topic for general discussion was "American Railway Problems," this bringing out many points of interest to other utilities. At the first session on Friday morning valuation was the general subject.

The first paper was that prepared by Pierce Butler, valuation counsel of the western group of railways. The title of this paper was "Valuation of Railway Property for Purposes of Rate Regulation." Mr. Butler's paper opened with the emphatic assertion that valuations of a utility, such as a railway, should be identical for rate-making, taxation, and investment purposes. Showing the great influence that the railroads have had in the development of the country, he pointed out that they were deserving of as fair treatment as any other business. In the case of the railroad properties reproduction has been taken until now as the basis of valuation. Rates based on an actual appraisal of the property have as yet been seldom chosen. Taking up the valuation now under way by the Interstate Commerce Commission, he said many foolish bases for valuation have been suggested. Mr. Butler's contention was that the same basis should be used for valuation purposes as in the determination of valuation in condemnation of private property, which value is guaranteed by the United States Constitution. This value, determined in a fair and equitable manner, should be used as much in rate-making as in public seizure by the right of eminent domain. This value is guaranteed as the fair market value.

T. S. Adams, member of the Wisconsin Tax Commission and secretary of the National Tax Association, then presented a paper entitled "Valuation of Railway Property for Purposes of Taxation." His opening statement was that the tax value depends primarily upon the earnings of a property. The contention that the valuation should be the same for tax assessment and for rate-making he does not believe in, because such an equality of valuation is favorable to prosperous railroads but not to poor ones. The local assessment for tax value has seldom been found good; usually it is too high for the poorer roads and too low for the stronger ones. Assessment by state authorities is better. Still better would be co-operative assessment by the authorities of contiguous states; federal assessment also would be good, but co-operative interstate valuation would be preferable. The object should be not to get uniform taxes throughout the states, but a uniform system of tax valuation. Any system of valuation based on complete interstate railroad systems is not as good as one taking each state as a basis by using a common method throughout; this is because state requirements and conditions are not the same, even in adjoining states. Professor Adams described in some detail the system of tax assessment used in Wisconsin. This is based on the average net earnings of five-year periods. The railroads are divided into groups of similar systems. Many features are taken into account, and valuations are determined on six different bases, which are given weighted values and a final valuation then determined.

W. Z. Ripley, professor of political economy, Harvard University, then presented a paper entitled "The Investor's Interest in Railroad Valuation." The importance of physical valuation of railroads is becoming better understood. Investors should encourage getting all possible light on the financial history and general condition of the properties in which they are interested. Valuation really is a matter of accounting. Professor Ripley cited the discrepancy between the cash cost and book value of the Chicago, Milwaukee & Puget Sound Railway system; the former was about $155,000,000, whereas the latter was put down as $255,000,000. Professor Ripley urged that the Interstate Commerce Commission put all possible effort to making a thorough physical valuation on railroad properties, and that close tab be kept on construction accounts hereafter. He referred to the financial manipulation of the New Haven, Frisco and Chicago & Alton railway systems. He commended the treatment of surplus by the American Telephone & Telegraph Company. He believed that physical value, if now known, would have a strong influence with both courts and commissions in obtaining rate increases sought by railroads.

In the general discussion which followed, W. D. Kerr, of Chicago, objected to the implied assertion in Mr. Butler's paper that unearned increments of value and donations be included in any fair valuation. This seems like an attempt to back up overcapitalization. David Friday, professor of economics at the University of Michigan, discussed the paper by Professor Adams, dissenting from him by believing that one valuation should serve for both taxation and rate-making. This should take into account the same factors. Economists are prone to consider value as market value, but for rate-making and taxation market value is not the best basis of valuation. As an evidence of the wholly bad character of assessment by local assessors, he cited a peculiar case where a Michigan local assessor had listed the step-down transformers in a substation connected with a high-tension transmission line as second-hand boilers valued at $500 each.

At the session on Friday afternoon Albert W. Bullard presented a very interesting paper entitled "Shall Improvements Made From Earnings Be Capitalized or Included in Valuation?" This paper, while referring particularly to railroads, presents conclusions which apply to public utilities in general and are exceptionally pertinent in view of the present financial situation.

Mr. Bullard points out in the paper that regulating bodies have expressed themselves generally as believing that the title legally is in the company. Modifications of this view are advanced to the effect that the public has an equitable interest in the surplus earnings invested in the property from which it may derive benefits through lower rates for the service rendered through better service or in other ways.

Judicial determination of this important question is not as conclusive as could be desired. The available decisions bearing upon the subject indicate the courts' feeling that net earnings and property derived therefrom are owned by the stockholders.

The railroads believe they have undoubted title to all the property which they possess without regard to the source from which it was produced. This belief carries with it the opinion that all net earnings belong to the stockholders.

Public opinion has been expressed to the effect that all earnings above a reasonable return belong to the public and that property acquired from such excess earnings is similarly circumstanced.

It is safe to say that the majority of successful businesses have, in large part, been built from earnings which have been retained in the business. It it a well recognized commercial principle, to which bankers fully subscribe, that only a portion of the profits should be distributed in cash to the proprietors of a business. The balance should be retained to increase working capital, or, in part at least, to provide additions to plant and inventory. These undistributed profits appearing first as a capital liability, under some such appropriate heading as "Undivided profits or surplus," are later, in part, converted into capital stock which is distributed as a stock dividend to the stockholders, or sold for cash and the proceeds of the sale distributed in like manner.

If the surplus which is capitalized is

derived entirely from earnings, and if a liberal amount is retained in the surplus account to meet unforseen contingencies, this method of building a business and issuing evidences of its growth to the proprietors has full sanction as being conservative and proper.

It is prudent for utilities to distribute in cash to their stockholders only a portion of their profits, retaining the balance in the form of surplus or undivided profits and investing it in improvements, extensions or working capital. If this course is pursued an amount of property will be acquired equal to the undistributed profits. Clearly the same kind of title to this property is in the company for the stockholders as that which would be held if the property had been obtained from the proceeds of bonds, notes or capital stock.

It therefore follows that the earnings from which this property was created are also the property of the stockholders, even though such earnings may be considered as in excess of a reasonable return on the investment. Regulation may recognize this capacity for excessive earnings and seek to limit future earnings to a reasonable return, but it should not be permitted to take away from the stockholders the earnings of the past.

If such a retroactive policy were possible bankers would be slow to underwrite and investors would hesitate to buy securities which were in part protected by the investment of surplus earnings in property the title to which is insecure.

The advocates of a proprietary public interest in railroads' surpluses have a number of serious difficulties to overcome before they reach firm ground. Their assertion that the earnings in excess of a reasonable return are the property of the public immediately provokes the questions: "What is a reasonable return?" and "Who are the public?" No standard has been created, nor is one likely to be, by which a reasonable return may be ascertained. Also, the public is held to variously mean, the government, the shippers who contributed the surplus, the future buyers of transportation—whose rates will be lower as a result of the existence of the surplus—and the people generally who may obtain a share in the surplus through heavy railroad taxation.

If this theory of public interest in the surplus of utilities is sustained, stockholders will be disposed to distribute all earnings in the form of cash dividends. Surpluses will become meagre and dividends irregular. Improvements will be dependent upon the ability to market securities to obtain funds to pay for them. During much of the past two years the securities market has been of comparatively small proportions and improvements have been difficult to finance. The outlook for the future is not encouraging.

In this discussion net earnings and their ownership and disposition have been given the most attention because upon a correct understanding of that phase of the subject will depend the opinion regarding valuation.

The investment banker ascertains among other things the amount and value of the property owned by a public service company, and the relation between that value and the amount of securities outstanding, in forming an opinion as to the soundness of the company's securities. It is not material to him that the property was in part acquired from the investment of net earnings, except as that indicates the conservative policy of the owners. The important facts are the value of the property and the quality of the company's title to it. If, as has been herein asserted, net earnings and property acquired with them are exclusively the company's then the property so obtained should be included in a valuation made for any purpose. If the stockholders prefer to re-invest the profits in the business and do so by leaving them there as surplus, rather than to take them out in cash dividends and put them back again as the purchase price of securities, the resulting additions to the company's property are identical as to ownership, sale value, and value for rate-making purposes. These conclusions seem inevitable.

The conclusions reached are summarized as follows:

That net earnings are the property of the stockholders, and, therefore, property acquired with net earnings is likewise the property of the stockholders;

That it is better to invest a portion of the earnings in improvements, and subsequently capitalize them after a liberal surplus has been created than to pay out all net earnings in cash dividends and sell securities to provide funds for all improvements;

That valuation has to do with the property owned and not the source from which funds to acquire it were obtained, and

Therefore, property obtained from net earnings should be included in a valuation for any purpose.

A comprehensive paper by Halford Erickson, railroad commissioner of Wisconsin, entitled, "Cost of Service as a Basis of Rate-Making," was then read. The arguments followed by Mr. Erickson are exactly in accord with his well known principles of rate-making for electric utilities, as published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of August 1, 1914.

On Friday evening an informal dinner was given by the Society, after which addresses were made as follows: "The Public View of the Railways' Need for an Increase of Freight Rates," by John H. Gray, professor of Economics, University of Minnesota; "Efficiency of Railway Operation in Relation to the Problem," by Samuel O. Dunn, editor, *The Railway Age Gazette;* "The Railway's View of the Freight-Rate Question," by E. P. Ripley, president, Atchison, Topeka & Santa Fe Railway Company.

The concluding session on Saturday morning was devoted to miscellaneous railway matters. The papers presented were as follows: "Railway Accidents and Safety First," by R. C. Richards, chairman, Central Safety Committee, Chicago & North Western Railway Company; "Freight-Car Surpluses and Shortages," by Arthur Hale, general agent, American Railway Association; "The Economic Significance of Interlocking Directorates in Railway Finance," by F. H. Dixon, professor of economics, Dartmouth College.

## Civil Service Examination for Hydroelectrical Engineer.

On December 15 the United States Civil Service Commission will hold an examination for a hydroelectrical engineer to serve at Camp John Hay, Philippine Islands. The salary is $2,400 per annum and traveling expenses in reaching the Philippines.

Applicants must be thoroughly familiar with the installation, construction, and operation of hydroelectric plants, including pipe lines, and have experience in testing, installing, and operating them. The plant at Camp John Hay is to be operated by Pelton water wheels. Applicants must have had at least six years' practical experience, of which two must have been in the constructing and installing of electric and hydroelectric machinery, and four years' experience in mechanical and electrical engineering, of which two years must have been in the practical operation of a hydroelectric power plant. Graduation from a technical school of recognized standing will be accepted as equivalent to one year of the required practical experience. Applicants must be between 25 and 45 years of age.

The examination will consist in a rating in which general education and experience will be given 40 weights and practical experience and fitness 60 weights. Applicants should secure Application Form 304 and the special form with the title of the examination by applying to the Commission at Washington, D. C., or at its various local offices in the principal cities of this country.

## Electric Lighting As a Factor in Civilization.

On the evening of November 24, a joint meeting was held in Chicago by the Electrical Section of the Western Society of Engineers, the Chicago Section of the American Institute of Electrical Engineers, and the Chicago Section of the Illuminating Engineering Society. W. A. Durgin acted as chairman. The paper of the evening was presented by S. E. Doane, chief engineer of the National Lamp Works of General Electric Company. The title of Mr. Doane's paper was

### Electric Lighting—A Factor in Civilization.

Mr. Doane pointed out that civilization in its final analysis is co-operative effort and one of the illustrations of this is electric service. Electric lighting involves two elements, the electric lamp and the supply of current. Today about 70 per cent of the output of incandescent lamps is made up of tungsten lamps. The cost of producing light is less than one-tenth of its value 20 years ago. This decrease is partly due to improvement of lamps and partly to economies in generating current. One of the problems today is to carry electric service into the smallest tenements and humblest homes where it is now regarded as an unattainable luxury. The rapid development of the incandescent lamp has now made this extension of service a possibility, but it involves the development of methods for handling the small customer which will lessen the fixed charges and the expense of handling small accounts. Mr. Doane then considered the performance of the incandescent lamp and its recent developments. These developments include not only the production of the gas-filled lamp, but improvements in the smaller vacuum lamps amounting to about 25 per cent. About five years ago 25-watt and 60-watt lamps operated at 1.31 and 1.23 watts per candle, whereas now they operate at 1.05 and 1.00 watts per candle, with the same useful life. This improvement is due to the use of drawn-wire filaments, modifications of the structure supporting the filament and the introduction of chemicals into the bulb. These lamps can now be operated at a higher temperature and are thus more efficient, and their mechanical strength has also been increased, while prices have been greatly reduced. Thus a 40-watt lamp in 1908 sold for $1.10 whereas in 1914 it sells for 30 cents. The increase of efficiency of about 20 per cent, however, has done as much to decrease the cost of light as the reduction in lamp price to one-third. Mr. Doane then explained the reasons for the higher efficiency of the gas-filled lamp. Since it operates at a higher temperature a larger proportion of its radiation is visible. There is also a larger amount of heat conducted away from the filament which must be dissipated from the bulb, and care must be taken to provide for this. The luminous efficiency of the gas-filled lamp is about 5 per cent, as compared with 3.3 per cent for the vacuum lamp. There is some advantage in a helical coil in the vacuum lamp as well as in the gas-filled lamp, since it permits a concentrated source which is desirabe in projection lanterns, etc. Lamps for this purpose are also made with better efficiency and shorter life than the commercial type. On account of the higher temperature, the light of a gas-filled lamp is whiter and it has made the production of artificial daylight by the use of colored screens more feasible. The new lamps are also of commercial importance for photographic work. Mr. Doane then pointed out the development in the methods of charging for electric service. It is now recognized that neither a charge based on the amount of light obtained nor upon the amount of electric energy supplied is entirely just. A system must be adopted which will permit all to make use of electric service. The problem of electric lighting has gotten beyond the point of efficient transformation of energy into light and the efficient generation of electric energy at the power house. The problem today is up to the engineers of distribution, who must economically wire the rooms they would serve, and to the accountant, who must devise a means for economically collecting compensation for service.

The discussion was opened by Peter Junkersfeld, who emphasized the need for subdividing the service in order to reach the smallest customers. The Commonwealth Edison Company of Chicago has just passed the point where it has over 250,000 customers. Of these some 20,000 have bills averaging only $12 per year or less. To extend the service to the smallest customers requires a great increase in investment and this in spite of the unprofitable character of the load of such customers. The problem is primarily one of financing, which is facilitated, however, by every possibility of keeping down the cost of serving these very small customers. It costs about 16.5 cents to render each bill in Chicago; this might be reduced by bimonthly or quarterly bills with certain safeguards. The cost of the meter, poles, etc., cannot be reduced very much. The line cost per customer may be reduced by increasing the density of the customers. The cost of interior wiring might also be reduced in order to reach this class of customers. However, if electric lighting is the only load furnished, the revenue from such service must always be very low. There are many electrical appliances that can be used to great advantage in even the most modest homes.

E. M. Tompkins spoke of the results obtained by the city of Chicago with the new gas-filled tungsten lamps in street lighting. These lamps are being used on a very extensive scale in the municipal system and have been found more flexible and lower in cost of installation and maintenance than the flame arc lamps which formerly were standardized in Chicago.

J. R. Cravath took up the question of investment required to serve small customers. He considered a case of a typical customer having four outlets with a connected load of 130 watts. The station investment for serving such a customer, exclusive of the meter, would be about $8, the meter alone would add another $8, and then there would be the cost of service drop wires and above that the cost of wiring the premises. In a city like Chicago this latter item alone would amount to from $25 to $30; in a small town this might be but one-half as much.

E. W. Lloyd dwelt on the tendency to increase the cost of wiring. There is urgent need for an opposite trend. All electrical interests should co-operate to secure this, because until it is possible to reach the very smallest customer the ideal of universal electric lighting cannot be achieved. The cost of the electricity itself is very small compared to the total cost of serving such a small customer. Mr. Lloyd believed that some equitable system of flat-rate service is needed.

V. H. Tousley took up the question from the standpoint of the National Electrical Code and municipal regulation and inspection. He briefly reviewed the history of the Code and explained how the municipal rules in Chicago, which are based on the Code, are drafted by a committee representing the various local electrical interests. The interest of the city is concerned primarily with reducing the fire and life hazards. The public, on the other hand, must be guarded against excessive cost of construction.

M. G. Lloyd spoke of the scientific aspects of the problem of increasing lamp efficiency. The disintegration of the filament is due fundamentally to its slow but continual distillation while in service. Gas-filling of the bulb checks this. Dr. Lloyd emphasized the need for screening the newest types of lamps on account of their very high intrinsic brilliancy.

A. Scheible narrated some of the achievements of electric lighting in the past and at the present time.

Mr. Doane closed the discussion by referring to experiments with attempts to use argon and mercury vapor for filling the bulb. These have not yet been brought to commercial fruition; the difficulty with argon is in getting it of sufficient purity; in the case of mercury vapor one of the difficulties is in getting a glass for the bulb that will withstand the necessarily high temperature. Gas-filled lamps operating in series with arcs will withstand some 40 per cent fluctuation in voltage while new; as they advance in age, however, they will become more subject to this matter and on the average probably will easily withstand 25 per cent fluctuations in voltage without materially affecting the rated life.

## HOLDING COMPANIES AND THE PUBLIC WELFARE.

### American Academy of Political and Social Science Holds Session With City Executives.

In conjunction with the conference of American mayors reported in our last issue, the American Academy of Political and Social Science held a session on Saturday evening, November 14, in Witherspoon Hall, Philadelphia, Pa. Mayor-elect Thomas L. Raymond, of Newark, N. J., presided and three addresses were made upon the subject of holding companies and the public welfare. The first of these was by Charles F. Mathewson, of counsel for the Consolidated Gas Company, New York City.

Mr. Mathewson first defined the holding company, which he stated might also be an operating company. He said there must be some good reason for the vast development which has taken place in holding companies, which were devised for a useful purpose, although they had sometimes been used for wrongful purposes, as was illustrated in the case of the Chicago, Rock Island and Pacific Railway. In some other cases they had been merely useless, but often they are a great benefit.

One advantage of holding companies is their ability to secure capital. Capital cannot always be obtained upon desire and the method of obtaining it must be satisfactory to the capitalist, who has indicated his greater willingness to provide funds through a holding company than by direct purchase. These companies, through their prestige can obtain funds in many cases, where a local utility could not. There is greater safety in investments covering a number of communities than where a single investment is entirely in one. Since the returns to the investor are, under regulation, made to depend upon the hazard involved, the holding company should represent a saving to the consumer. There are also advantages in the common employment of engineering and legal talent, etc., by a number of utilities. A more rapid development of the utility is made possible by the funds thus available and this gives the possibility of improving load-factor and other operating conditions. He considers holding companies largely responsible for the decrease in the cost of generation of electric energy in privately owned central stations, whereas in municipally owned plants there has been an increase in cost, as shown by census figures.

Other reasons for preferring holding companies to direct ownership are found in many local laws which may prevent direct ownership or require the consent of all of the stockholders, or a large fraction thereof, in order to make a direct purchase of the plant. It is preferable to have some interest in the plant locally owned and the right of eminent domain is usually granted only to local corporations. If direct purchase is attempted, some stockholders will usually attempt to hold up the purchaser by demanding a high price. By merely controlling a utility the holding company can get control of a larger number of plants, all of which will reap benefits. Holding companies in the utility field are not open to the objections which have been made to holding companies in ordinary business where interstate commerce is involved. A utility must be located in the same territory as the people served and is just as amenable to state laws as if locally owned—more so than if directly owned by a foreign corporation. No question of competition is involved on account of state regulation and of the nature of the business. Development has been greatly advanced through the centralization of financing and management and the holding company has come to stay because it is an instrument of progress.

The next address was by Francis T. Homer, of New York City. Mr. Homer confined his discussion to electric, gas and street railway companies. Such concerns were specifically excluded in the national legislation affecting holding companies since they have a natural monopoly and the object of a holding company is not to restrain competition. The most serious charge against holding companies is overcapitalization and they are indeed susceptible to this abuse. The capitalization of the holding company, however, has nothing to do with overcapitalization of the operating company, since the latter is not influenced by the ownership of its securities. The most extravagant overcapitalization occurred in the days when competition was common. Of recent years it has been almost negligible.

The securities of a local company sell better if it is controlled by a holding company so that they can be marketed at the best time. The combination of interest in a number of local utilities makes a better investment with less hazard. Nearly every individual utility has at times experienced a temporary setback, but nearly every holding company has shown steadily increasing returns. This is because its showing is based upon the average of a number of utilities. This was well illustrated at the time of the Ohio floods, which caused the stoppage of dividends of many plants. This was a hardship to individual owners. Plants controlled by holding companies met similar losses, but they were balanced by gains elsewhere so that there was no setback in the returns to investors in the holding companies. The holding company institutes comparative competition for efficiency, etc., in the various plants coming under its control. The average economy and efficiency is consequently higher in the subsidiaries of such a company than in plants of isolated companies. Better engineering talent can be afforded by each plant through the division of costs and each has the benefit of the experience of all. Mr. Homer advocated similar co-operation by different holding companies in an association for their mutual benefit.

Regarding the effect of holding companies upon the cities in which they operated, Mr. Homer said there was no direct effect. Cities want good service, fair rates and fair treatment of employees regardless of where the stock is held. In case of state regulation the amount of outstanding stock or the identity of its owners is not considered. Capital stock is simply evidence of a proportional ownership in a corporation and involves merely this relation between the holder and the corporation. It does not affect the relations of the corporation to the state or to other parties. The manager of a holding company realizes the lack of local sympathy which is present when stock is mainly held locally and he must consequently be more careful in his treatment of local customers. The growth of a community is reflected in its utility companies and the company is best serving its stockholders which helps in the building up of the community. When any improvement in one company operated by a holding company is found to give good results, it is immediately copied in the others under the same control. The commercial departments of these companies are better organized and do more to extend the service. Nothing is so detrimental to the utilities as a lack of understanding of their problem and the utilities consequently welcome the present conference of mayors as a source of information. Whatever is unfair to a utility is likewise injurious to a community. He called attention to the fact that in spite of the hazards of obsolescence, etc., there had been a constant lessening in the cost of both gas and electricity. Although street railway fares usually remain fixed, there had been increases in the speed, comfort and length of ride. Street railway companies of this country which are either directly controlled by or affiliated with holding companies represent 81 per cent of the securities of this class; electric light and power

companies 82.5 per cent; gas companies 66 per cent. There are now about 140 holding companies in these three fields, representing through ownership or affiliation over $5,900,000,000. The interest of national banks in the securities of holding companies increased 20 per cent in 1913. This indicates an increase of confidence in these companies.

The final address was made by James P. Goodrich, director of the National City Bank, Indianapolis. Mr. Goodrich claimed not to be an advocate either for or against the holding company, but pointed out some of the disadvantages as well as the advantages of this type of corporation. He first reviewed the historical development of holding companies, which had sprung up very largely in the past ten years, but said there was no objection to the common ownership and operation of utility properties; but all the benefits of consolidation are obtained as well through owning and management companies as through holding companies. The holding company is often preferred, however, since there is no limitation to stock issues, etc. Over 30 per cent of the central stations of this country are now controlled by holding companies. The advantages of the holding company can be divided into two general classes: (1) operating efficiency through combined purchasing, engineering and legal services; (2) banking facilities. Regarding the first class, the same advantages are obtained by owning and management companies as by holding companies. He cited two utilities, which are among the most efficiently managed in the country and which are not controlled by holding companies, to illustrate that this form of control is not essential to efficient management. These are the street railways in the Twin Cities and the gas company in Indianapolis. In Indianapolis there are two electric companies, one of which is controlled by a holding company, but no particular advantage has been shown by the latter in results. He quoted another case where an electric railway was taken over by a holding company, with a result of a decrease in net revenue in spite of an increase in gross revenue. He pointed out the injustice to minority stockholders that may result when the holding company merely secures a controlling interest in the operating company, as by purchasing, say, 51 per cent of the stock. This has been frequently illustrated in steam railroads. He thought the holding company should be compelled to acquire all or none of the stock of the operating company. The fact that holding companies do not have to appeal to regulatory bodies for security issues is a convenience to their promoters, but is not in the interest of either investors or the public. He could not accept the claim that these issues are of no interest to the public when the securities of the local companies are regulated. He pointed out that the faith of the country was involved since many of these securities are sold abroad. Many, also, are taken by insurance companies, saving banks and similar institutions so that their soundness is a matter of general interest. The tendency of human nature to over-issue securities is always present. He pointed out that the issues of operating companies are frequently accompanied by holding-company issues of double the amount. Although such issues give no legal basis for rates which should earn dividends upon them, commissions hesitate to make reductions which make big cuts in the value of securities held abroad and by saving institutions. He cited a case of an operating company which was taken over by a holding company and later made an application for an increase in rates, although the previous owner had paid 18 per cent in dividends. In another case a holding company controlling two properties required one of them to make payments to the other in order that the latter might show a profit. Mr. Goodrich said that he had no sympathy with the cry against big business. Utilities are not finished properties and will need more capital in the future. Investments honestly made in them must be protected. If public interest requires the control of securities of operating companies, it also requires the same control of holding companies.

In closing the meeting, Dr. Carl Kelsey, representing the American Academy, read a telegram from Governor McGovern of Wisconsin, sending greetings from the meeting of governors held in Madison.

## Columbus Jovians Meet With Ad Club.

One hundred Columbus, Ohio, Jovians enjoyed the privilege of meeting Elbert Hubbard at noonday luncheon, on November 19. The noted Roycrofter had an engagement here on that date to address the Columbus Chamber of Commerce in the evening. When his coming was announced local Jovians, desiring to do honor to one of the Order's most famous members, began to plan for some form of reception. Tribune C. J. Metz, who was personally acquainted with Mr. Hubbard, communicated with him on the subject. The following characteristic reply was received:

Dear Jovians:—

Your telegram received. I much regret that I have an invitation to luncheon on Thursday, November 19, with the Ad Club boys, so I will be unable to be with you, much as I would like. However, I hope to see you face to face while I am in Columbus. So here is a handgrasp, and I am as ever,

Yours fraternally,
Elbert Hubbard.

Not to be disappointed, the Jovians put the matter up to the Ad Club of making the luncheon a joint affair on the part of the two organizations. This plan was readily concurred in by the advertising men, with the result that Mr. Hubbard was greeted by two groups of friends, instead of one. The affair took place at the Virginia. While it was technically under the auspices of the Ad Club, the honors were with the Jovians in the way of numbers. As the formal evening address of Mr. Hubbard was to be on "Getting Together," the same theme appropriately served as the inspiration for his delightful talk at the luncheon. The regular bi-weekly noonday meeting of the Jovians had been postponed from the previous Friday in anticipation of this event.

## Engineers for City Managers.

Henry M. Waite, bsuiness manager of the city of Dayton, Ohio, addressed a joint meeting of the Boston Section, American Institute of Electrical Engineers, Boston Society of Civil Engineers and the Boston Section, American Society of Mechanical Engineers, in Boston, November 18. Mr. Waite outlined the new charter of the Dayton city government, which consists of a board of five commissioners, a business manager, and a director of each of five departments.

Of special interest to the engineering profession were Mr. Waite's delineations of the duties of the city manager and of the head of the department of service, which has to do with the public utilities.

It was pointed out that the newly created office of business manager presented an attractive career to the engineer. A great hindrance was found in the fact that members of that calling were often loath to enter public service, owing to its uncertain tenure; also the habit of the engineer in working out his problems in private was a deterrent, since the office demanded more or less contact with the public. This defect in the engineer's training should be remedied in his educational course. The change, by which 16 American cities are now governed by city managers, with several more contemplating the adoption of the plan, opens a new field for the engineer, as well as beginning a new era in the efficient government of cities.

## A London Electricity Authority.

The scheme for a London electricity authority to be set up is now definitely drawn out and Parliament will shortly be asked to approve of the purchase of the existing electricity supply systems and of the control of these by the one new authority, which shall give a concession to a company for the construction of all necessary generating and distributing works, and for the operation of the new and the existing undertakings for 50 years. One part of the scheme will involve an expenditure of $25,000,000 during the first five years, 1915 to 1920, and afterwards sums at the rate of $5,000,000 per annum. There is room for considerable doubt as to whether the scheme will be able to go forward in the prevailing war conditions. It is not thought likely that the British government will be inclined to approve the raising of any large sums by way of public loans except for war purposes for some time to come. This aspect of the matter has been borne in mind by the Finance Committee of the London County Council, but it is not going to allow it to prevent the application being proceeded with. It explains that the purchase of the existing undertakings will not mean raising new loans, inasmuch as special stock would be exchanged for shareholdings in the present companies. The purchase, however, will not be effected without a premium on present holdings, which must mean a larger amount of new stock than at present exists in the supply concerns.

## Activities of Society for Electrical Development.

The Society for Electrical Development, Incorporated, as shown by its November monthly report, is steadily broadening the scope of its activities. Its four principal sections are all energetically engaged in their work, extending the propaganda of the Society to those interested in electrical enterprises of all kinds. Sample copies of two new booklets have been distributed to members. Of these, "Electricity in the Home" is an attractively illustrated publication of 36 pages printed on fine paper. It contains a comprehensive reference list and brief description of electrical devices suitable for home use, together with data on power consumption, etc. "Household Electricity" contains the same reading matter, but has less illustrations and is not so expensive a publication as the foregoing. Electrical fixture postcards are being furnished to fixture dealers. Poster stamps are in preparation and an attractive calendar for 1915 is ready for use by members. Special advertising copy and cuts have been prepared for use by members in local newspaper advertising. A very clever cut shows Santa Claus up to date as the chauffeur on a large electric truck loaded with boxes of electrical Christmas gifts. The window-display service of the Society has proven increasingly popular with the members, who are realizing excellent returns from the helpful suggestions supplied. The Society is being represented in more and more electrical organizations of all kinds and at all national and state and many local gatherings of electrical men it has a staff representative in attendance.

## Proper Illumination and Industrial Safety.

The importance of proper illumination as a major factor in the consideration of industrial safety was emphasized to the members of the Lehigh Valley local council of the National Council for Industrial Safety by A. M. Klingman, of the National Lamp Works of the General Electric Company at a meeting held in the assembly hall of the Lehigh Valley Light and Power Company at Allentown, Pa.

By means of lantern slides, actual cases were shown where serious accidents have occurred through the lack of good illumination and other instances where the ounce of prevention in the form of scientific illumination made the pound of cure entirely unnecessary.

The Lehigh Valley local council for Industrial Safety includes in its membership the operating officials of practically all the important industrial plants in the Lehigh Valley district and monthly meetings are held in turn at the various plants represented in the membership.

W. F. Roberts, superintendent of the Bethlehem Steel Company, is president of the local council.

## New Institute Branch in West Virginia.

At the meeting of the Board of Directors of the American Institute of Electrical Engineers, held in New York City, November 13, authority was granted for the organization of a Branch at West Virginia University.

In accordance with action taken by the Section Delegates in conference at the Detroit convention last June, Section 55 of the Institute by-laws relating to the term of office of the Section chairmen and secretaries was amended so as to permit the term of office to begin either on January 1 or August 1.

Upon the recommendation of the Board of Examiners, 29 applicants were elected to the grade of Associate, and 108 students were ordered enrolled.

## Ohio Mechanical, Electrical and Steam Engineers Meet.

The Ohio Society of Mechanical, Electrical and Steam Engineers, which has an electrical membership of about 40 per cent of the total, held a three-day session at Columbus, November 19-21. There was an attendance of betweeen 50 and 60, out of enrollment of some 200. This was considered very satisfactory for a Fall meeting of the society.

From an electrical standpoint, the chief feature was a paper by E. C. Raney, of Columbus, on "The Automatic Reclosing Circuit-Breaker." It consisted of a technical description of an invention in which Mr. Raney is interested, for shutting off electrical power automatically when the load reaches a maximum to which it has been adjusted. Its greatest field of usefulness, it was claimed, is in the protection of direct-current circuits of mines, mills and elevator service. In the case of mines the system was urged as being of growing importance, as the tendency in this industry is to purchase power from a central plant rather than maintain a small isolated plant. The circuit-breaker, it was stated, was also ideal for the protection of branch circuits in mines and mills, since it affords individual protection to these circuits without interrupting the service on the entire electrical system.

"Safety First as Applied to Traveling Cranes," by Henry F. W. Arnold, a consulting engineer, of Columbus, gave a detailed account of the most approved electrical devices used in this class of machinery. The electric motor brake, automatic limit switch and signalling by the use of colored electric lamps, were among points emphased.

Visit in a body to plants about the city included the Spring Street power station of the Columbus Railway, Power and Light Company, where the centripetal boiler-feed pump was seen in operation. The electrical plant inside the walls of the Ohio State Penitentiary, which supplies power to some six or seven state institutions located in Columbus, was also an object of much interest.

A banquet was held at the Columbus Hotel on Thursday evening, presided over by President William C. McCracken, superintendent of power and buildings at Ohio State University. Mr. McCracken was reelected president, and Prof. Frank E. Sanborn, also of the University, was again chosen secretary and treasurer. Joseph McCue, of the State Board of Steam Engineers, was made first vice-president. Toledo was selected as the place for the June meeting of the society.

# New Electrical and Mechanical Appliances

## Dumore Sewing-Machine Motor.

Any specialty that is going to be used in the home must be simple to operate and easily put into use, if it is to be practical and become a popular selling article. These points were considered in the design of the new Dumore sewing-machine motor. It can be used on any make of sewing machine used in the home and can be attached without tools of any kind. This motor is manufactured complete by the Wisconsin Electric Company, Racine, Wis., and is one of the latest inventions of Chester H. Beach. It operates on direct or alternating current and is so constructed that an automatic switch starts and stops the motor at the will of the operator.

New Sewing-Machine Motor.

The motor is in operation only while the sewing machine is being used.

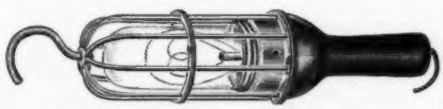
The application of the Dumore motor to the sewing machine in no way interferes with the ordinary working of the machine. The bobbin is filled in the regular way and the original belt is left on the machine. The motor is well built and is fully guaranteed. It is made as near foolproof as possible. There are no complicated parts to get out of order and give trouble.

The motor case is finished in black enamel and the other metal parts are handsomely oxidized. Each outfit comes packed in a separate carton properly labeled and marked, and can be shipped out by parcel post as the outfit packed complete and ready for shipment weighs but 6.5 pounds.

This Dumore specialty makes an ideal present for the mother, wife or sister, and is bound to become a very popular seller as it is being put out by the Wisconsin Electric Company at an extremely low price at retail and is being marketed through jobbers, dealers and central stations.

## Safety Portable Lamp Guard.

In working around gasoline tanks or in the neighborhood of any highly inflammable substances, any precautions that decrease the hazard are in the line of the popular "Safety First" movement. An improved vaporproof lamp guard for portable lamps has been devised to minimize the danger in the use of portable, trouble-hunting hand lamps in garages and similar places. It has a heavy wire frame, a strong handle, handy grip hook and vaporproof receptacle. An important feature is the ease with which access to the globe is obtained. The frame can be unscrewed in a moment and the globe removed. These lamp guards



Safety Portable Lamp Guard.

are made by the McGill Manufacturing Company, Valparaiso, Ind.

## Paragon Time Switch.

To meet the increasing demand for a reliable but simple and moderate-priced time switch, the Paragon Electric Company, 15 South Clinton Street, Chicago, Ill., has placed on the market a new device of this type. It has been developed as the result of extended study and experimentation and is believed by the manufacturer to meet all requirements.

As shown in the cut herewith, the outfit is compact and neat. The casing is of cast iron, heavily and attractively japanned or finished in any way desired. In the indoor types a glass circle in the door discloses the clock dial, so that the outfit serves as a clock as well. The door of the case closes against a rubber gasket making the inside impervious to moisture or dust. All the outdoor models are equipped with a heating coil and regulating thermostat. This prevents hardening of the oil and consequent clogging of the works in severe weather. This special feature is included in all outdoor Paragon time switches at the regular price.

The outfit proper consists of a high-grade, full-jeweled clock, a powerful spring motor and a standard rotary snap switch. Each of these three parts are in a separate section and can be removed separately without interfering with the other parts. The clock serves merely to release the spring motor, which in turn operates the snap switch directly below it. The entire arrangement is simple in design and rugged in construction so as to not easily get out of order.

The adjustment feature covers a great variety of arrangements. When

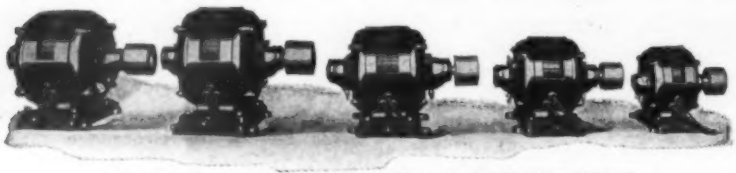
New Time Switch.

used for an electric sign or window display, it will turn the lights on at a predetermined hour and turn them off again at the proper time. It will turn on part of the lights and later the rest, or it will turn off part of the lights and finally the balance. It does this every day in the week or it can be adjusted to skip one day, as Sunday, for example. It only requires winding once a week and as the case is securely locked, it cannot be tampered with. These switches can be used for controlling directly any circuit, carrying up to 30 amperes, that can be turned on and off by a time switch. For circuits over 30 amperes the switch is of the remote-control type and is installed at the most advantageous point in the circuit; it is connected by three No. 14 wires with the clock mechanism, which can be installed at any convenient point desired.

## New Line of Polyphase Induction Motors.

The Robbins & Myers Company, Springfield, O., has recently completed the development of an entirely new line of polyphase induction motors, ranging in size from 0.25 to 7.5 horsepower, inclusive. They are supplied for operation on two-phase or three-phase, 110, 220, 440 and 550-volt circuits of all commercial frequencies.

The frame of these motors consists of a cast-iron skeleton-type shell which supports the stator. This exposes the stator core to the air and gives thorough ventilation. The end heads are cast separately from the frame. They are machined to fit the frame and are attached by four machine screws. Exceptionally large bearings and oil reservoirs are provided. The bearings are grooved to distribute the lubricant and are made dustproof.



Group of New Robbins & Myers Polyphase Induction Motors.

The stator is built up of soft, annealed steel laminations which are held together by bolts. The rotor is of the squirrel-cage type. The core is built up of steel laminations which are keyed to a cast-iron spider. The rotor bars are connected to the end rings, which are recessed to fit them, by double riveting and soldering.

Terminals are brought through holes in the frame suitably bushed with insulating material. Each motor is regularly furnished with a sliding base and cast-iron pulley. They can also be supplied with idler-pulley attachments or back gears, if desired.

The illustration above gives a good idea of the construction of the main parts of these new motors.

## Oil Switches for Manhole Service.

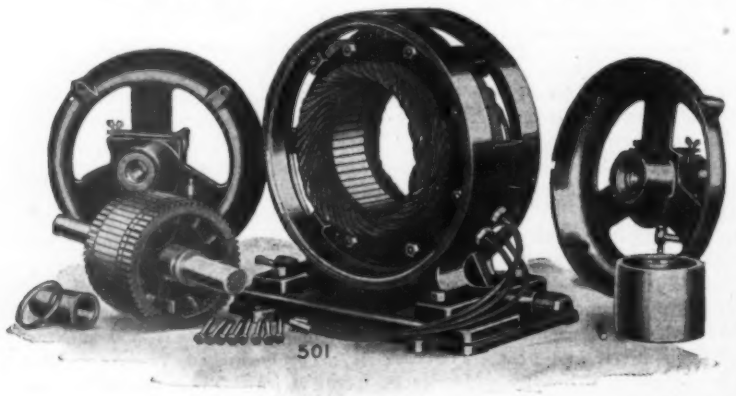
Two new types of manhole oil switches for mounting on flat vertical surface have recently been developed by the General Electric Company, Schenectady, N. Y. One of the switches is for operating by hand and the other by a solenoid, which is an integral part of the switch. They can be used in locations where there is danger of flooding.

In the hand-operated switch there are two bell chambers through which run the leads to and from the switch. These chambers are of the usual construction and, after the leads are connected to the switch terminals, are filled with an insulating compound and made air-tight. The bell chambers as well as the oil vessel and cover are cast iron. They are bolted to the cast-iron switch frame, the joints being made water-tight by gaskets. The operating handle is outside the frame and can be operated by a hook from the entrance to the manhole. The shaft handle passes through a stuffing box.

The solenoid-operated switch is as a rule operated from the central station by the usual remote-control switch located in the station. The mechanism is especially simple, the plunger of the solenoid being connected direct to the cross head attached to the operating rods. The switch solenoid uses current only while the switch is in the act of closing or opening by means of the tripping coil. The switch is held closed by a catch, which allows the switch to open by gravity when the catch is thrown out of position either by the trip coil plunger or by a small tripping lever located outside the switch frame.

Both hand and solenoid-operated switches have an indicator which can be seen from the top of the manhole and shows whether the switch is open or closed.

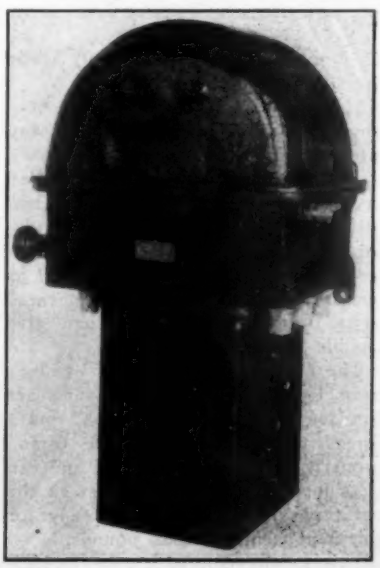
10,000-Volt, 200-Ampere Oil Switch.



Five-Horsepower Polyphase Induction Motor Disassembled.

## Core-Loss-Testing Outfit.

An outfit used for determining the hysteresis and eddy-current losses of sheet iron and steel, the core loss being read directly on a wattmeter, has been recently introduced. The complete equipment consists of a specimen or sample holder, frequency meter, ammeter, voltmeter and wattmeter of suit-



2,500-Volt, 300-Ampere, Solenoid-Operated Oil Switch.

able capacity to make the required measurements.

The sample holder is shown in Fig. 1 and consists of four solenoids mounted along the sides of a square wooden base in such a way that, when the test pieces are placed in them, a continuous magnetic circuit having four equal sides is formed, the corners of this circuit being held down firmly by means of a four-jawed clamp worked with a toggle-joint mechanism at the

Fig. 1.—Sample Holder for Core-Loss-Testing Outfit.

center. This insures equal pressure at all four corners and also insures the same pressure being exerted each time a test is made. By this method of clamping the personal equation is eliminated and a saving in time is also effected.

Each of the four coils has a primary and secondary winding. The four primaries are connected in series and the ends are brought out to terminal posts. The secondaries are arranged in the

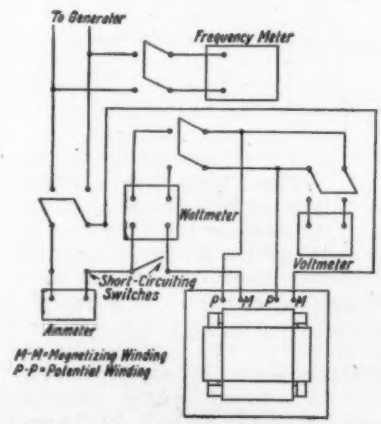



Fig. 2.—Connections for Core-Loss Testing.

same manner. The coils are wound on Micarta tubes and a layer of cotton tape is wrapped around the outside. All wooden parts are black-lacquered, while the toggle-joint handle and terminal posts are nickel-plated. A pedestal for mounting this sample holder can also be furnished, if desired.

The procedure of test is that recommended by the American Society for Testing Materials. The scheme of connections used is shown in Fig. 2. The material to be tested is made up of strips, 3 centimeters by 50 centimeters, divided into two portions, 5 kilograms (11 pounds) each, one cut parallel to and one at right angles to the direction of rolling. Each portion is divided into two equal parts by balancing against each other, and each bundle is tied together with string or tape (not wire) and inserted in the solenoids, the two halves of the same portion being placed on opposite sides. A piece of tough paper 0.01 centimeter (0.004 inch) thick should be inserted in the joints at the corners. An alternating voltage should then be applied to the primary winding and the corners of the magnetic circuit tapped together with the tapping block, which is furnished with the outfit (see Fig. 3), until the current has a minimum value, as shown by an ammeter in series. The corners are then firmly clamped by means of the toggle-joint. The ammeter is shunted and the primary voltage adjusted until the voltmeter in the secondary circuit reads the standard value. This adjustment can

Fig. 3.—Tapping Block.

be made by means of an autotransformer, by varying the field of the alternator, or both, and not by inserting resistance or inductance in the primary circuit. Similarly, the frequency must be adjusted to 60 cycles. The wattmeter is then read and the instrument losses, which will be constant at any one voltage and for any set of instruments, subtracted. The result divided by ten equals the loss in watts-per-kilogram or standard core loss.

The outfit described above is made by the Westinghouse Electric & Manufacturing Company.

## Automatic Electric Bench Washers.

The washing machine illustrated herewith is manufactured by the Automatic Electric Washer Company, Newton, Iowa. Three important features are noteworthy in connection with the machine as now offered.

A cutout has been applied to the wringer-driving mechanism, so that by merely touching a lever the shaft which drives the wringer may be stopped or started. This machine has a swinging wringer and it is therefore necessary that bevel gears be used to drive it; the wringer shaft is driven by a chain running over sprockets on the wringer shaft and the main drive shaft. Bevel gears cannot be made to run with as little noise as spur gears, and chain and sprockets necessarily make some noise. As it is not necessary that the wringer run constantly, by means of this new cutout all unnecessary noise is eliminated.

Another improvement is that the dolly inside the washer is now solidly attached to the dolly shaft, instead of working up and down on the shaft. The shaft projects through the cover, working up or down according to the amount of the clothes in the tub. This new arrangement allows no opportunity for the clothes to become entangled with the dolly shaft, and there is no chance for lost motion, as was formerly the case when the hole through the dolly for the shaft became worn.

Still another new feature is the fact

New Automatic Electric Bench Washer.

the manufacturers now include as part of the equipment of the bench washer a splendid galvanized rinse tub. This tub is of the best quality material, No. 2 size, with pressed metal handles. It is neatly trimmed with gold bronze bands and matches up nicely in appearance and quality with the remainder of the machine.

These improvements and additions will be greatly appreciated by the many customers of this progressive and up-to-date company, which spares neither effort nor expense in keeping in an advanced position in the washing-machine field.

## Telephone Train Dispatching on the Cedar Rapids & Iowa City Railway.

The Iowa Railway & Light Company, which operates the Cedar Rapids & Iowa City Railway, has in successful operation a telephone train-dispatching equipment covering the entire line. This railroad runs from Cedar Rapids south to Iowa City, a

distance of approximately 30 miles, with a branch going east from Cedar Rapids to Mt. Vernon, a distance of 15 miles. This includes some of the best farming land in Iowa where traffic is exceedingly heavy. The passenger trains on these lines are operated by electricity and the freight trains by steam.

Ten way (or open) stations are equipped with telephones and selective signaling apparatus furnished by the Western Electric Company. Six waystation outfits are installed between Cedar Rapids and Iowa City and two between Cedar Rapids and Mt. Vernon. The power house, the superintendent's office and the shop are also connected with the telephone-dispatching circuit. The dispatcher is located two miles south of Cedar Rapids in the shop office building and controls all points on the line.

A portable telephone set has been furnished to each train crew so that communication may be had with headquarters at various points along the line. These telephones are fitted with cords and plugs arranged for plugging into pole jacks placed at a convenient height on the telephone poles along the right of way. This equipment is especially valuable in emergencies. Nine pole jacks are placed on the Cedar Rapids and Iowa City division and six on the line to Mt. Vernon.

An idea of the traffic on this railway system may be obtained from the fact that 38 passenger trains and 4 scheduled freights run daily on the Cedar Rapids & Iowa City branch, and 18 passenger trains and 2 freights operate daily on the Cedar Rapids & Mt. Vernon branch. The telephone dispatching system has now been in use for some months and excellent results from every point of view, notably economy and efficiency of operation, are reported.

## Allen-Bradley Universal Unit-Type Battery-Charging Switchboard for Garage Service.

A battery-charging switchboard for garage purposes, which, although it is extremely compact, is simple in construction and very easy to operate, has been placed on the market by the Allen-Bradley Company, Milwaukee, Wis. These switchboards were laid out with the view of obtaining the greatest possible convenience, compactness and durability, and at the same time to be able to withstand the most critical inspection.

Fig. 1 shows a battery-charging panel complete with six charging stations to which four more can be added without unduly increasing the height of the board, and thus making it awkward for the garage attendant to operate. It is built up according to the unit system embodied in the sectional-bookcase idea. When complete, the Allen-Bradley switchboard consists of one instrument panel and four unit rheostat panels. The instrument panel includes the main line switch, a voltmeter and an ammeter, two battery-charging rheostats, the main distributing fuse panel, the wrought angle-iron frame and floor supports, and the necessary switches, conductors, etc. A unit rheostat panel,

Fig. 1.—Unit-Type Battery-Charging Switchboard.

a view of which is shown in Fig. 2, includes two battery-charging rheostats and the necessary switches, fuses, etc., besides the proper screws for fastening the slate panel to the wrought-iron frame or support of the instrument panel.

The latter alone may be purchased first and additional unit rheostat panels can be easily added later on as necessities require. Such an arrangement is ideal as it not only permits the small garage to purchase a standard equipment, but also provides for its future growth. In like manner the large garage is benefited by the same. Formerly, when the capacity of its board had been reached and it was desired that the charging equipment be uniform, it was necessary to purchase a complete, many-circuit board, whereas one or two additional charging rheostats would have satisfied the immediate demands. This involved a large idle investment which is now eliminated, since the charging switchboard can grow with the business.

These switchboards are built in two different standard sizes, one having 60 amperes capacity; the other 100 amperes capacity. The extreme dimensions of the 60-ampere board are 2 feet by 7 feet, while the 100-ampere board is 3 feet by 7 feet. The height of the operator's reach, however, is never above 5.5 feet.

The battery-charging rheostats used are of the graphite-compression-resistance type, which are very compact, control the current perfectly and eliminate all complicated wiring, face-plate segments, sliding contacts, etc., which are inherent and usually objectionable features of the old form of wire-wound

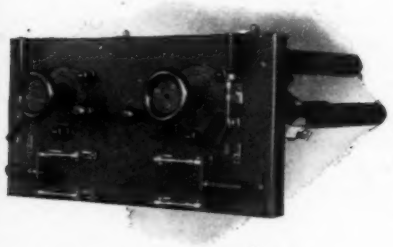


Fig. 2.—One of the Unit Panels.

or grid-type chargers. The range of the Allen-Bradley battery charger is very great and any number of cells, from one up to the maximum permitted by the voltage of the supply circuit, may be charged with a single rheostat. As the resistance of these rheostats is not varied by the cutting in and out of resistance units by means of a contact arm and segments, but is dependent upon the pressure applied, the current may be set exactly at any desired value, regardless of the number of cells being charged, and may be raised or lowered gradually, without the characteristic "steps" of other rheostats. This feature is of great importance in battery-charging work as it saves the life of the battery and also gives the rheostat much greater latitude of adjustment.

The compression-type battery-charging rheostats have come into general use, and many of the most modern garages, both large and small, are either equipped with the switchboard complete or have a partial installation of Allen-Bradley battery-charging rheostats.

# Latest Approved Fittings

**The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.**

**ATTACHMENT PLUGS, Fused.—The Bryant Electric Company,** Bridgeport, Conn.

"Bryant" or "Perkins," 3 amperes, 250 volts, catalog No. 485.

For use with approved glass-tube inclosed fuses.

Approved October 22, 1914.

**ATTACHMENT PLUGS, Fuseless.—General Electric Company,** Schenectady, N. Y.

"G. E." 10 amperes, 250 volts.

Cord connector, catalog No. GE450.

1500 watts, 250 volts.

Cord connector, catalog No. GE450.

Approved October 12, 1914.

**CABINETS.—Central Cornice Company,** 2940 North Avers Avenue, Chicago, Ill.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Approved October 19, 1914.

**COMPUTING MACHINE.—Underwood Computing Machine Company,** 30 Vesey Street, New York, N. Y.

"Underwood" computing machine, for use on 110 volts and 220 volts, direct and alternating-current circuits. A motor-driven attachment applied to the Underwood typewriter, whereby the numeral keys operate a special switch controlling the motor, which drives the computing mechanism. Connection to the supply circuit is made by approved reinforced cord and an approved attachment plug.

The current required is less than one ampere. For use on ordinary lighting circuits.

Approved October 20, 1914.

**CUTOUT BASES, Plug Fuse.—Benjamin Electric Manufacturing Company,** 11 Charlotte Street, Toronto, Can.

Porcelain cutout bases for Edison plug fuses.

All types, 0-30 amperes, 125 volts, catalog Nos. 8020, 61935, 62587, 62965.

Approved October 20, 1914.

**DISH-WASHING MACHINE.—Bromley-Merseles Manufacturing Company, Incorporated,** 215 West Superior Street, Chicago, Ill.

"Crescent" dish-washing machine.

This device is a dish-washing machine in which water is circulated by a motor-driven rotary pump. The motors are rated at 110 volts, 0.1 horsepower and are supplied in either direct or alternating current types. Safeguards to prevent injury to persons are provided in the form of covers for current-carrying and revolving parts.

Approved October 20, 1914.

**FASTENERS. — Adapti Manufacturing Company,** 919 West Street, Cleveland, O.

Flexible tubing fastener in form of a clamp with notches, to engage the tubing secured by a machine screw to a switch or outlet box having beveled corners.

Approved October 2, 1914.

**FIXTURES.—Wheeler Reflector Company,** 156 Pearl Street, Boston, Mass.

"Wheeler" window, gallery and show-case reflector.

Catalog No. 85, consisting of a mirror-lined sheet-metal trough, made on order, specifying length of fixture and spacing of lamps.

Approved October 15, 1914.

**FUSES, Cartridge Enclosed.—Kirkman Engineering Company,** 173 Lafayette Street, New York, N. Y.

"K. E." cartridge inclosed fuses, 0-30 amperes, 250 volts; 0-30 amperes, 600 volts.

Approved October 20, 1914.

**INSULATING MATERIALS.—The Duranoid Manufacturing Company,** 213 Chestnut Street, Newark, N. J.

"Duranoid Condensite."

Note.—Laboratories' tests indicate that this molded material is highly non-absorptive, has excellent mechanical and moderate dielectric strength and is not noticeably affected by oils and but slightly by acid. It is not strictly non-combustible but is little affected by temperatures below 400 degrees Fahrenheit.

It is judged suitable for parts of electrical devices requiring these properties. Manufacturers of such devices desiring to use this material should submit samples in commercial form for examination and test.

Approved October 15, 1914.

**LAMP ADAPTERS.—The Arrow Electric Company,** 103 Hawthorne Street, Hartford, Conn.

Mogul to medium base, 660 watts, 250 volts, catalog No. 292.

Medium to candelabra base, 75 watts, 125 volts, catalog No. 392.

Candelabra to miniature base, 75 watts, 125 volts, catalog No. 391, for use only in decorative lighting systems, Christmas-tree lighting outfits and for similar purposes.

Approved October 20, 1914.

**LAMP GUARDS.—Electric Service Supplies Company,** Seventeenth and Cambria Streets, Philadelphia, Pa.

This device consists of a porcelain receptacle mounted in a substantial wooden handle with heavy cast collar and wire guard.

"New Keystone," catalog Nos. 12504, 32146.

"Essco," catalog Nos. 18996, 18997.

Approved September 18, 1914.

**LAMP GUARDS.—McGill Manufacturing Company,** Valparaiso, Ind.

"McGill" vapor-proof portable for use in garages or damp places.

Approved October 1, 1914.

**RECEPTACLES, Standard.—Weber Electric Company,** Schenectady, N. Y.

"Weber." Porcelain shell.

Keyless, 1,500 watts, 250 volts, catalog No. 1422.

Approved October 14, 1914.

**RECEPTACLES, Weatherproof.—The Arrow Electric Company,** Hartford, Conn.

"Arrow E."

660 watts, 250 volts, catalog Nos. 4003, 9407, 9408, 9411, 44912, 61577-78.

660 watts, 600 volts, for use with incandescent lamps in series on 600-volt circuits, catalog Nos. 40, 109, 121, 122, 59107.

Approved October 13, 1914.

**SIGN MACHINES.—M. C. Ryan Company,** Phoenix, N. Y.

110 volts, alternating current, 6 amperes.

"Phoenix" magnetic thermo flashers consisting of from one to four solenoid-operated switches, the solenoid circuits of which are controlled by a small thermo flasher. All current-carrying and operating parts are mounted in a sheet-metal cabinet.

Approved October 17, 1914.

**SIGNS, Electric.—Electric Carriage Call Company,** Christopher Street near Washington Street, New York, N. Y.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Approved September 15, 1914.

**SWITCHES, Automatic.—The Cutler-Hammer Manufacturing Company,** Milwaukee, Wis.

Pressure regulator (making and breaking pilot circuit), bulletin No. 6762.

Not approved for use in connection with automatic sprinklers or similar fire protective equipments, for which services their merits have not been investigated.

Approved October 26, 1914.

# Current Electrical News

### NORTH ATLANTIC STATES.

NEWFANE, VT.—The Twin State Gas and Electric Company is to furnish this town with electricity for street lighting and domestic purposes, from the generating plant at Vernon, Vt. Repairs are being made on the company's station at West Dremmerston.

SWANTON, VT.—The village has begun the operation of a municipal electric lighting plant. Power is generated at Highgate Falls. The community purchased a private plant and also undeveloped power rights, controlling a 400 foot head, which will be developed. This is the first municipal lighting plant in Vermont.

WEBSTER, MASS.—A vote will be taken in the matter of an additional appropriation of $3,600, which is needed to complete the construction of Day Brook conduit.

DUNKIRK, N. Y.—A new system of street lighting to replace the carbon lamps with incandescent gas-filled lamps is planned by the board of water commissioners. The electric arches which have been used on Central Avenue and Lion Street will be removed.

STILLWATER, N. Y.—A committee has been appointed to secure ways and means to install an electric lighting system. Address chairman of electric light committee.

ALLENTOWN, PA.—A bakery to cost $100,000 is being erected in Allentown by the Kolb Company of Reading. About 50 horsepower in motors and 200 lighting units will be installed and energy will be supplied by the Lehigh Valley Light and Power Company. The plant will be ready for operation by February, 1915.

### NORTH ATLANTIC STATES.

CLEVELAND, O.—Legislation providing for a $200,000 bond issue for new lighting system covering the entire downtown business district has been introduced, and it is expected that Cleveland will have a great white way before June 1, 1915.

CLEVELAND, O.—The Forest City Electric Company has increased its capital from $100,000 to $200,000.

PORTLAND, IND.—New electric lights have been petitioned for.

ROCHESTER, ILL. — Members of the village board of Rochester and officials of the Springfield Utilities Company are negotiating with a view of having the company furnish current to the village. The company now has wires within three miles of Rochester.

SPRINGFIELD, ILL.—The Springfield city commission will reject an offer of the Springfield Utilities Company to take over the municipal electric light plant and light the streets of the city for $30,000 a year less than it is now costing the municipality. At a conference of the commissioners on November 20 it was decided that the offer should not be accepted, because of possible future results. The city has purchased a new 750 kilovolt-ampere turbo generator, to be installed in an auxiliary plant at the city pumping station. When this generator is installed Commissioner Spaulding of the Public Property Department, says the city can light the streets much cheaper than now. Citizens who favor the acceptance of the Utilities Company's proposal to take over the municipal plant and light the streets may initiate a popular election on the question.

ASHLAND, WIS.—The electric light system will be extended at a cost of $4,000. Address city clerk.

WATERTOWN, WIS.—Before February 1, 1915, the streets of Watertown will be lighted by an entirely new system of lights which will burn all night, according to the terms of the 10-year contract entered into with the Watertown Gas and Electric Company.

MINNEAPOLIS, MINN. — Council public lighting committee has instructed the city clerk to advertise for bids on street lights for 1915.

MINNEAPOLIS, MINN.—The council public lighting committee has instructed the city clerk to advertise for bids on street lighting for 1915. The motion adopted by the committee includes gas lighting, electric arc lights and ornamental lights. Address city electrician.

RED WING, MINN.—The cities of Red Wing, Minn., and Eau Claire, Wis., with the co-operation of the commercial bodies of those cities, have decided to create white ways in their respective cities, the boulevard system of lighting to be installed and operated by the Wisconsin-Minnesota Light and Power Company, a subsidiary of the American Public Utilities Company, of Grand Rapids, Mich. The ornamental iron posts at Red Wing are to be furnished by a local firm; the ornamental iron work at Eau Claire will be furnished by an Eau Claire foundry from patterns approved by the civic and commercial association of that city.

SHAKOPEE, MINN. — The city council at a recent meeting passed an ordinance, effective October 1, 1915, by which the municipal power plant is to furnish electric energy for motor purposes at five cents per kilowatt-hour. The low rate is conditioned on patrons using not less than $1 worth of electrical energy per month for each horsepower of each motor connected.

WINDOM, MINN.—Plans for a new electric light plant at Windom have been prepared by Earl Jackson, consulting engineer, of St. Paul. Address village clerk.

MICHIGAN CITY, N. D.—Bonds have been voted to install a modern light plant. Address town clerk.

CLARKSON, NEB.—The city is in the market for transformers and about 15,000 feet of feeder. Address L. J. Raubinek, superintendent.

DEWITT, NEB.—The electric light plant will be purchased by the city council and extensive improvements will be made. Address village clerk.

LEAVENWORTH, KANS.—Promises of support by army officers and officials of the Soldiers' Home have been secured for the project to establish a White Way between Fort Leavenworth and Lansing. The city would install and maintain lights within its boundaries from north to south on the route; the Chamber of Commerce is planning to secure the financial support of other interests that would be affected. M.

PAWNEE ROCK, KANS.—T. J. Stinson has purchased the electric light plant. Necessary improvements will be made.

WATHENA, KANS.—Lines are to be extended to Ellwood and to Bellemont from the line out of St. Joseph now supplying Wathena with electric light. M.

JOPLIN, MO.—Charles A. Patterson, Commissioner of Public Utilities, has suggected the bonding of the electric light plant and the raising of at least $150,000 for increasing its capacity. Mr. Patterson and Charles Nelson, superintendent of the plant, have compiled data to show citizens why the improvements are necessary; many new street lights are wished, and it is said that a large number of domestic consumers cannot now be supplied. On three occasions a bond issue for enlarging the electric light plant received a majority of the votes cast, but fell short of the majority required. M.

### SOUTH CENTRAL STATES.

HENDERSON, KY.—The difference between Mayor Johnson and the city council respecting repairs on the city power plant, made necessary as a result of the damage done by the tornado of last summer, have been adjusted without recourse to the courts, and the extensive and costly construction work that was projected wil be left for a time when the city will be better able to handle the work, while a temporary structure, to cost about $3,500, will be erected to protect the boiler plant, which is now exposed.

PERRYVILLE, KY.—The Perryville Ice and Electric Company contemplates purchasing additional equipment. Address secretary.

### WESTERN STATES.

COLUMBIA, MONT.—The farmers and business men of Park City and the Lake Basin district have decided to spend $10,000 this winter in erecting rural telephone lines. About 200 miles of wire will be strung.

DOOLEY, MONT.—Preparations are being made by O. B. Haven and Frank Courteney of Antelope, for the installation of an electric light plant at Dooley. They are in the market for electrical machinery.

BRIGHAM CITY, UTAH.—The county commissioners of Boxelder County have decided to purchase the electric light bonds of the town of Mantua. At the board meeting held here this week County Attorney W. J. Lowe appeared on behalf of the Mantua town board and presented a resolution from that board regarding the sale of bonds in the sum of $3,000. The commissioners approved the Mantua resolution and then passed a resolution for the purchase of the bonds. The people of Mantua contemplate the installation of an electric lighting system, for which the proceeds of the bond issue will be used. Power will be purchased from Brigham City.

KAMLOOPS, B. C.—Bonds in the sum of $40,000 for the development of electric light service will be voted upon here shortly.

TACOMA, WASH.—Light Superintendent Collins recently submitted petitions of property owners on "D" street for luminous arc lights, to the city council. The petitions request the council to install the system of lighting along the full length of South D Street, from South Seventh to Twenty-first Street. From an authentic source comes the information that the work wil be started early in 1915. O.

VANCOUVER, WASH.—The capital stock of the Yaquina Bay Electric Company, maintaining head offices in Vancouver, Wash., has been increased from $20,000 to $40,000. It is reported that needed extensions and improvements to the plant and properties in and near Yaquina, Ore., will be made. Also that A. Welch, owner of numerous light and power projects in this section of the country, has become identified with the corporation. O.

RIDGEFIELD, ORE.—The Bratlie-McClelland Shingle Mill Company, of Ridgefield, has applied to the city council for a franchise to furnish this city with electric lighting and power facilities. The council acted favorably on the application, and instructed the committee on franchises to frame an ordinance for this purpose as soon as possible. The Shingle Mill Company is making preparations for enlarging its power plant on Lake River, and it is understood the company is on the market for a new boiler, additional generating equipment, and some electrical machinery. O.

HERMOSA BEACH, CAL.—Residents on Pier Avenue in the Camino Real district are negotiating for the installation of an ornamental lighting system from the city limits of Hermosa Beach to those of Manhattan Beach.

NEWPORT BEACH, CAL.—The city council has let the contract to F. O. Engstrum Company, of Los Angeles, for $17,728 for the construction of its ornamental lighting system. Bonds in the sum of $20,000 were voted for the improvement. One hundred and thirty-eight posts will be installed, topped with 16-inch globes. The Pacific Light and Power Company will furnish power at 6 cents per kilowatt-hour.

## PROPOSALS.

ELECTRIC PASSENGER ELEVATOR.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until December 14, for the installation complete of an electric passenger elevator in the United States post office and courthouse at Minot, N. Dak. Copies of drawings and specifications may be had at the office of the Supervising Architect.

ELECTRICAL EQUIPMENT, NAVY DEPARTMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until December 8, for furnishing the following electrical equipment: 4,500 feet leaded and armored, galvanized, soft steel cable for interior communication, and 900 feet leaded and armored, galvanized, soft-steel wire, twin conductor, as per Schedule 7599, for delivery at Brooklyn Navy Yard; 575 feet submarine, single-conductor, steel-armored cable for 600 volts and less, as per Schedule 7586, and 15,400 tips for five-ampere watertight attachment plugs, as per Schedule 7582 for delivery at Navy Yard, Brooklyn, N. Y.; 6,700 watertight, five-ampere attachment plugs, without tips, as per Schedule 7582, for delivery east and west.

ELECTRIC LIGHT FIXTURES.—Sealed proposals will be received by the Board of Directors of the Municipal Tuberculosis Sanitarium, Room 1514 Fort Dearborn Building, 105 West Monroe Street, Chicago, Ill., until December 3 for furnishing and installing electric light fixtures in all buildings of the Chicago Municipal Tuberculosis Sanitarium at North Crawford and Bryn Mawr Avenues. Address W. A. Wiebolt.

## FINANCIAL NOTES.

Directors of the Detroit Edison Company have formally decided to offer to stockholders for subscription at par $2,645,500 ten-year six-per-cent convertible debentures.

The consolidation of the Columbus Light, Heat & Power Company with the Columbus Railway, Power & Light Company is assured, as more than two-thirds of the outstanding stock of the two concerns has approved the plan. Steps will be taken immediately to complete the merger of the properties. The stockholders of the Columbus, Light, Heat & Power Company will receive what they originally demanded, that is, one share of series "A" preferred for one share of their preferred, and one share of series "B" preferred for one share of their common. It is probable that the consolidation of the two companies will be completed before the close of the year. This action will bring all the lighting, power and heating properties in Columbus into one concern.

### Dividends.

| | Term | Ratio | Payable |
|---|---|---|---|
| Am. Tel. & Cable | Q | 1.25% | Dec. 1 |
| Blackstone Val. Gas & Elec., pf. | S-A | $3.00 | Dec. 1 |
| Blackstone Val. Gas & Elec., common | Q | $2.00 | Dec. 1 |
| Cent. Mis. Val. Prop, pf. | Q | $1.50 | Dec. 1 |
| Colorado Power, pf. | Q | 1.75% | Dec. 15 |
| Conn. Power, pf. | Q | $1.50 | Dec. 1 |
| Dom. Pr. & Trans., pf. | — | 2% | Dec. 15 |
| El Paso Elec., common | Q. | $2.25 | Dec. 15 |
| El Paso Elec., pf. | Q | $3.00 | Jan. 11 |
| General Elec. | Q | 2% | Jan. 15 |
| Louisville Trac., common | Q | 1% | Jan. 2 |
| Mackay Companies, com. | Q | 1.25% | Jan. 2 |
| Mackay Companies, pf. | Q | 1% | Jan. 2 |
| Northern Ohio Trac. & Lt., common | Q | 1.25% | Dec. 16 |
| Penn. Ltg., common | S-A | 1% | Nov. 30 |

## PERSONAL MENTION.

MR. H. M. FLANDERS, formerly of Worcester, Mass., has been elected manager of the Springfield Street Railway, Springfield, Mass.

PROF. MICHAEL I. PUPIN, of Columbia University and Servian Consul General in New York, lectured on the Servian side of the European war before the students of Amherst College on November 14.

MR. B. ELSHOFF has recently resigned his position as superintendent of the electrical department of the Canadian Westinghouse Company, Ltd., to become works manager of the Diehl Manufacturing Company, Elizabeth, N. J.

MR. SAMUEL W. GOULD, of Skowhegan, who was recently appointed a member of the new Maine Public Utilities Commission, failed of confirmation by the Governor's Council, and MR. CHARLES W. MULLER, of Bangor, has been appointed in his stead by Governor Haines.

MR. J. H. PETERSON, new-business manager of the Menominee & Marinettee Light & Traction Company, Menominee, Mich., is the proud father of twins, a boy and a girl, born November 15. Mr. Peterson, who is well known for his successful new-business campaigns in the twin cities, has a host of friends who join in extending hearty congratulations.

MR. DOW S. SMITH, general manager of the Dan Patch Electric Lines, Minneapolis, Minn., has resigned to become general superintendent of the Priest River Light and Power Company, Priest River, Ida., which is to supply electric light and energy to Spokane. Mr. Smith was formerly connected with the Priest River Company. He will remain in Minneapolis till spring.

MR. F. W. HARVEY, JR., has accepted the position of secretary and advertising manager with the *Technical World Magazine*, of Chicago. Mr. Harvey is well known in Chicago electrical circles, having been business manager of *Popular Electricity Magazine and the World's Advance* and later assistant manager of the Chicago Electrical Trades Exposition Company. He was alternate statesman of the Jovian Order last year and is the present treasurer of the Electric Club of Chicago.

MR. GEORGE W. HILL, special representative of the National Electrical Contractors' Association, has been appointed statesman-at-large for the Jovian Order by Jupiter Homer E. Niesz. Mr. Hill is widely acquainted in the electrical field and is constantly traveling throughout the country. He is an ardent Jovian and will take an enthusiastic part in spreading the gospel of mutuality and co-operation in increasing the utilization of electrical energy and current-consuming devices.

MR. J. HARRY PIEPER, statesman of the Southern California Jovian League, is destined to be one of the busiest men on the Coast during the coming year. In addition to many other activities with which he is connected, he has just been elected president of the Advertising Club of Los Angeles. The Advertising Club is one of the leading organizations in Los Angeles, and Mr. Pieper has been elected on a platform of "a big man

for a big job." Aside from being host to the advertising clubs of the world, the club is planning to take a prominent part in helping to entertain the tens of thousands of guests who are expected to visit Los Angeles during the next year. Mr. Pieper was for some time identified with the electric sign industry in Boston and New York, and went to Los Angeles in 1909 to promote the electric sign work of the Southern California Edison Company. In 1912, in addition to his sign work, he took over the electric vehicle business of the company. Since December, 1913, his title has been assistant to the general agent.

### OBITUARY.

MR. FOREST E. BARKER, chairman of the Gas and Electric Light Commissioners, of Massachusetts, died in Washington, D. C., November 20. He was at the capital in attendance on a convention of railroad commissioners. Death was caused by heart disease.

Mr. Barker was born at Exeter, N. H., September 29, 1853, the son of Josiah G. and Betsey (Kent) Barker. He attended Wesleyan University in Connecticut, graduating in 1874, and studied at the Boston University Law School two years. He took up his residence in Worcester, Mass., where he practiced law. He served for several years on the School Board of Worcester, was a member of the General Court of 1883-84, and was chairman of the Republican Congressional Committee. In 1885 Mr. Barker was appointed to the Board of Gas and Electric Light Commissioners by Governor Robinson. He served on that board continuously since that time, being chairman since 1894. In 1894 and 1896 he made visits to Europe to study the lighting of cities, by order of the Legislature. He was regarded as an authority on electric and gas lighting matters, and his judgment and probity were in high esteem. Mr. Barker was one of the most prominent Masons in the state, having been at the head of lodges in his home city, and a member of the State Consistory, of which he was elected second lieutenant-commander. He later received the thirty-third degree. Mr. Barker married Flora I. Hovey, of Worcester. His son, Stanley G. Barker, is a lawyer of Boston.

### DATES AHEAD.

American Society of Refrigerating Engineers. Annual meeting, New York City, November 30-December 1. Secretary, W. H. Ross, New York, N. Y.

American Society of Mechanical Engineers. Annual meeting, New York, N. Y., December 1-4. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

American Institute of Chemical Engineers. Seventh annual meeting, Philadelphia, Pa., December 2-5. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

American Mining Congress. Seventeenth annual session, Phoenix, Ariz., December 7-11. Secretary, J. F. Callbreath, Denver, Colo.

Electrical Supply Jobbers' Association. Quarterly meeting, Tutwiler Hotel, Birmingham, Ala., December 8-10. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

International Exposition of Safety and Sanitation. Grand Central Palace, New York, N. Y., December 12-19.

American Association for the Advancement of Science. Annual meeting, Philadelphia, Pa., December 28, 1914, to January 2, 1915. Secretary, L. O. Howard, Washington, D. C.

Western Association of Electrical Inspectors. Annual meeting, Minneapolis, Minn., January 26-28, 1915. Secretary, W. S. Boyd, Chicago, Ill.

## With the Electrical Manufacturers

**The Abbott Ball Company,** Hartford, Conn., announces that it has perfected special machinery for the manufacture of bearing balls in steel, brass and bronze and will furnish all sizes from one-eighth inch to one-half inch in diameter, and will later be in a position to furnish all other sizes.

**The Ward Leonard Electric Company,** Bronxville, N. Y., has issued three new sections of its catalogs E-9, E-10 and E-11, describing and illustrating overload and underload and no-voltage circuit-breakers, designed for small motor and battery protection. The company reports an increased demand for banks of theater dimmers. The company has introduced a dimmer for tungsten lamps with 110 steps. Recent installations and contracts have been made with theaters in every part of the country.

**The Terry Steam Turbine Company,** Hartford, Conn., announces a considerable improvement in business upon the part of industrial plants as is evidenced by new orders for turbines and generator equipment. The Mountain Ice Company, of Lake Hopatcong, N. J., is increasing its equipment by the installation of a 219-kilovolt-ampere turbogenerator set, and another company that is enlarging its manufacturing facilities is the Excelsior Needle Company, of Torrington, Conn., which is installing an additional 375-kilovolt-ampere Terry turbo-alternator set in its power plant.

**Belden Manufacturing Company,** Western Avenue and Twenty-third Street, Chicago, Ill., has just issued catalog No. 6, together with discount sheet applying thereto. The catalog contains 181 pages and is neatly bound in blue cloth. More than 30 pages have been required to list recent additions to the Belden line of wire and allied products; among these are new forms and coverings of magnet wire, phosphor-bronze wire, motor-lead wire, motion-picture-machine cable, automobile ignition and lighting cable, flexible steel conduit, armored cable, Bakelite sheets, rods, tubing and molded insulation, flexible cordage, new stranded copper cables, new tips and terminals, winding machines, varnishes, tapes and webbings. Many wire tables and valuable data are included. The company has also issued bulletin No. 1009 on vulcanized fiber sheets, rods and tubing.

**Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., reports the following among orders recently received: Ithaca Traction Corporation, Ithaca, N. Y., two 300-kilowatt, three-phase, self-starting rotary converters; two 300-kilovolt-ampere, three-phase, 60-cycle, 2,200-volt transformers; one six-panel switchboard. Cleveland, Youngstown & Eastern Railroad, Cleveland, O., two 300-kilowatt, three-phase, self-starting rotary converters, and one five-panel switchboard. Cleveland & Eastern Traction Company, Cleveland, O., three 185-kilovolt-ampere, single-phase, 16,500-volt transformers. Standard Electric Construction Company, New Orleans, La., one 400-kilowatt, 1,200-volt rotary, consisting of two converters in series on one bedplate; three 125-kilovolt-ampere, single-phase, 6,600-volt transformers, one three-panel switchboard. Sioux City Service Company, Sioux City, Iowa, one motor-generator set, 300-kilowatt, 275-volt, direct-current, commutating-pole generator with 450-horsepower, 550-volt, shunt wound direct-current motor on common base and shaft; one five-panel switchboard. Wilmington & Philadelphia Traction Company, Wilmington, Del., two 150-kilowatt, 2850-volt, three-phase, 60-cycle, commutating-pole self-starting rotary converters; two 165-kilovolt-ampere, 2,400-volt, three-phase transformers; one three-panel switchboard. Jacob Epstein, Baltimore, Md., one direct-current, 250-kilowatt, 125-250-volt, generator. United Electric Light & Power Company, New York City, two 20,000-kilowatt, three-phase, 25-cycle, 6,600-volt, 1,500-revolutions per minute, maximum-rated 100 per cent power-factor, steam turbogenerator units; two 200-kilowatt, motor-generator sets, each consisting of one 250-volt, direct-current generator and one three-phase, 60-cycle, 7,500-volt induction motor; three 5,500-kilovolt-ampere, single-phase, 24,600/6,600-volt, air-blast transformers; three 1,000-kilovolt-ampere, 10,650/5,720-volt transformers; three 5,000-kilovolt-ampere, 23,000-volt transformers; three 1,000-kilovolt-ampere, 10,000-volt transformers; one 13-panel switchboard.

# Record of Electrical Patents.

## Issued by the United States Patent Office, November 17, 1914.

**1,117,156. Secret Telephone Exchange.** R. M. Beard, New York, N. Y. The operator can listen on only one subscriber's line at a time.

**1,117,184. Controller.** H. E. Goldberg, Chicago, Ill., assignor of one-half to R. P. Lamont. For a movable electric switch element.

**1,117,185. Electrolytic Cell.** A. M. Griffin, Kansas City, Mo., assignor of one-half to M. O. Hackett. Includes an inverted vessel inclosing a part of each anode.

**1,117,186. Ice Machine.** C. C. Hansen and A. P. Anderson, assignors to Peerless Ice Machine Co., Chicago, Ill. Has motor-driven compressor and pump.

**1,117,191. Motor-Starting Rheostat.** G. McD. Johns, St. Louis, Mo. Includes centrifugal means for cutting out resistance as motor speed increases.

**1,117,198. Electric-Circuit-Controlling Apparatus for Train Lighting and Similar Systems.** E. H. M. Langley and E. W. Price, assignors to Electric & Ordinance Accessories Co., Ltd., Birmingham, England. Special arrangement of solenoid switches.

**1,117,201. Internal-Combustion Engine.** R. H. Libke, assignor to Steiner Mfg. Co., Chilton, Wis. Magneto ignition system with the magneto geared to the crank shaft at a speed ratio of 2.5 to 1.

**1,117,211. Lineman's Chair.** F. W. Mayes, Hopkinsville, Ky. For running suspended from the messenger cable.

**1,117,212. Automatic Telephone-Exchange Apparatus.** F. R. McBerty, assignor to Western Electric Co. Special arrangement of busy-back test devices in connection with connector and selector switches.

**1,117,213. Time Controlled Electric Switch and Recording Register.** H. B. McCabe, assignor to Gisholt Machine Co., Madison, Wis. Includes a number of indicating and printing wheels.

**1,117,215. Telephone Toll Device and Circuits Therefor.** J. L. McQuarrie, assignor to Western Electric Co. Electromagnetically controlled step-by-step advanced service meter, which gives a signal after a predetermined number of steps.

**1,117,231. Loud-Speaking Transmitter.** J. C. R. Palmer and A. F. Pinkler, assignors to Western Electric Co. Special arrangement of electrodes and carbon-granule chamber.

**1,117,239. Method for Treating Films for Motion-Picture Machines.** N. Power, Brooklyn, N. Y. Consists in subjecting the edges to electric heat sufficient to melt all matter fusible at a temperature to which a film is subjected in the projection machine.

**1,117,240. Method of Insulating Wire of Aluminum and the Like.** E. Presser, Berlin, Germany. Consists in passing the wire through an electrolyte and sending a current through the wire.

**1,117,252. Image Projector.** W. Sams, Chicago, Ill. Includes an electric lamp.

**1,117,266. Fluoroscopic Apparatus.** H. C. Snook and E. W. Kelly, assignors to Roentgen Mfg. Co., Philadelphia, Pa. Special mounting of X-ray tube.

**1,117,267. Vacuum Regulation.** H. C. Snook, Philadelphia, Pa. A method of reducing the vacuum of X-ray tubes consists in liberating an inert monatomic gas.

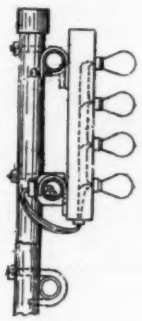
**1,117,270. Lighting Fixture.** E. C. Sofio, Hoboken, and L. Schepmoes, Hasbrouck Heights, N. J., assignors to Safety Car Heating & Lighting Co. Socket lamp and shade are adjustable as a unit.

**1,117,277. Heating Apparatus.** S. G. Supplee, East Orange, N. J. Electric emersion-type liquid heater.

**1,117,285. Safety Lock.** W. F. Walker, Chicago, Ill., assignor of one-eighth to M. Borwick, one-fourth to C. F. Dusman, and one-eighth to A. B. Cameron. Electric lock for magneto circuit and fuel valve.

**1,117,290. Semi-Automatic Telephone System.** A. H. Weiss, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Special interconnection of line, cutoff and supervisory relays with connector switches.

**1,117,293. Induction Coil.** D. H. Wilson, assignor to D. H. Wilson and R. Bines, New York, N. Y. Has three primary coils and three secondary coils wound on one side of the core and three similar sets on the opposite side.



1,117,435.—Electric Sign.

**1,117,296. Impulse Transmitter.** J. A. Wotton, assignor to Western Electric Co. Make-and-break device operated by motor-driven shaft.

**1,117,297. Telephone-Exchange System.** J. L. Wright, assignor to F. C. Stevens, Attica, N. Y. Has a testing switch between the first and second selector switches and between the second selector and the connector switches.

**1,117,329. Tire-Pressure Indicator and Electric Signal.** C. C. Cleveland, Boulder, Colo. Electric alarm is actuated when tire pressure drops below minimum.

**1,117,335. Speed Indicating and Signaling Device.** J. Coplon, Buffalo, N. Y. Electric signal circuit is closed when speedometer index reaches a certain point.

**1,117,339. Electric Regulation.** J. L. Creveling, New York, N. Y., assignor to Safety Car Heating & Lighting Co. Includes two generators, two storage batteries and regulating equipment therefor.

**1,117,347. Electric Thermostatic Fire-Alarm Contacts.** H. Dixon, assignor to F. D. Curtis, Hamilton, Ont., Canada. Diaphragm and contact arrangement.

**1,117,351. Propulsion of Vessels.** G. S. Edlin, Makino, New Zealand. Special ignition arrangement for explosion chamber.

**1,117,361. Speed Control for Motors.** S. K. Evans, Elmsford, N. Y. Electric circuit-controlling contact on speedometer.

**1,117,376. Circuit Controller.** C. O. Harrington, assignor to Union Switch & Signal Co., Swissvale, Pa. Solenoid-controlled ball contact for signal gong.

**1,117,378. Combined Generating and Starting Apparatus for Gas Engines.** J. A. Heany, assignor to A. E. L. Leckie, Washington, D. C. Includes motor-dynamo and storage battery, starting and then driven by the auxiliary engine.

**1,117,394. Controlling Apparatus. N.** Joleen, Chicago, Ill. Pressure-governed motor control for electrically driven air compressor.

**1,117,396. Circuit-Controlling Device.** M. M. Kandle, assignor to Kandle-Born Co., Springfield, Mass. To indicate when an article has been accurately placed against a slotted gauge plate.

**1,117,407. Telephone System.** E. Land and F. L. Fisher, assignors to F. C. Stevens, Attica, N. Y. Semi-automatic system with automatic rotary Y-switches.

**1,117,435. Electric Sign.** G. F. Peglow, St. Paul, Minn. Detachable letters can be mounted on skeleton framework and electrically connected to receptacles forming taps on the circuit wires in the framework. (See cut.)

**1,117,441. Third-Rail Contact.** S. Przespolewski, Carnegie, Pa. A three-part roller contact on the shaft of a duplex hanger.

**1,117,473. Steering-Wheel Heater for Road Vehicles.** W. P. Barton, Idaho Falls, Idaho. Electric heating elements.

**1,117,484. Electric Bell.** C. W. Dunham, assignor to Union Switch & Signal Co. Solenoid-operated gong.

**1,117,485. Electromagnet.** O. F. Forsberg, assignor to Western Electric Co. For telephone coin box.

**1,117,486. Registering Mechanism.** O. F. Forsberg, assignor to Western Electric Co. For telephone circuits.

**1,117,493. Method of Charging Secondary Batteries.** M. R. Hutchison, assignor to Edison Storage Battery Co., Orange, N. J. Consists in dividing the battery into three groups and half completely charging two sets in series until the full battery is completely charged.

**1,117,511. Automatic Trunk Signaling System.** F. R. McBerty, Western Electric Co. Electrically lighted number indicator associated with registers of automatic telephone system.

**1,117,517. Mechanism for the Operation of Performing Figures.** A. D. Phillips, Waynesburg, Pa. Operated by an electric motor.

**1,117,548. Suction Supporting Device.** A. Bouchery, assignor to Wallace Novelty Co., New York, N. Y. Suction cup on base of portable lamp to affix same to walls, mirrors, etc.

**1,117,553. Selective Switching Apparatus.** E. B. Craft, assignor to Western Electric Co. A number of selector switches are driven by common power shaft and controlled by an interrupter.

**1,117,559. Railway Signaling.** W. F. Follett, assignor to Union Switch & Signal Co. Block signal system operated by alternating current.

**1,117,588. Electric Hoist.** G. K. Mitchell, Baltimore, Md. Interconnection between brake and motor switches.

**1,117,590. Inclosed Fuse.** W. J. Morgan, assignor to C. B. Merrell, Chicago, Ill. Relates to method of securing the end blades.

**1,117,599. Lightning Arrester.** H. M. Pingen, Toledo, O. Has gas-tight chamber for the terminals.

**1,117,605. Organ Blower.** A. J. Schantz, Orrville, O. Driven by a motor mounted in a separate compartment.

**1,117,616. Magneto Machine.** L. A. Williams, Evanston, Ill. Special release for the rotary.

**1,117,620. Semi-Automatic Winding Machine.** A. H. Adams, assignor to Western Electric Co. Motor-driven spool with means for moving the wire guide.

**1,117,633. Signaling System.** C. E. Beach, assignor to G. O. Knapp, New York, N. Y. Interconnection of transmitting devices, resistances and non-interference magnets.

**1,117,646. Circuit Closer.** V. Durbin, and H. Ehrismann, assignors to Holtzer-Cabot Electric Co., Brookline, Mass. Push-button with tubular casing.

**1,117,647. Water-Tight Attachment Plug and Receptacle.** V. Durbin, assignor to Holtzer-Cabot Electric Co. Includes a spring-actuated toggle for closing the aperture.

**1,117,650. Detachable Lamp Socket.** M. Erlanger, assignor to E. I. Rosenfeld & Co., Baltimore, Md. The socket terminals are pointed corrugated prongs which are pushed through the circuit wires into the supporting board.

**1,117,652. Means for Regulating Centrifugal Oil Burners.** M. A. Fesler, Oakland, Cal. Electric motor for rotating the burner is controlled by a thermostat.

**1,117,657. Combined Heating and Cooling Apparatus.** W. A. Freeman, Shreveport, La. Includes motor-driven air compressor.

**1,117,681. Spark-Gap for Wireless Telegraphy.** J. Loeffler, Vallejo, Cal. Has conical electrodes in a conical chamber.

**1,117,683. Electric Trap.** C. W. McNaughton and R. M. McDonald, Milwaukee, Wis. Has electrocuting contacts.

**1,117,684 and 1,117,685. Coiling Machine.** A. McMurtrie, assignor to Thomas & Betts Co., New York, N. Y. For applying steel armor to cables.

**1,117,686. Machine for Forming Spiral Tubing.** A. McMurtrie, assignor to Thomas & Betts Co. Modification of the above.

**1,117,687. Coiling Machine.** A. McMurtrie, assignor to Thomas & Betts Co. A further modification.

**1,117,689. Electrical Regulator.** C. A. Moore, Johnstown, Pa. Special electromagnet with rheostat in series with one of its double windings.

**1,117,706. Fire-Alarm Box.** E. L. Rowley and G. H. Gibson, Detroit, Mich. Special door construction.

**1,117,722. Track-Controlled Mechanism.** A. H. Sweetland, assignor to National Street & Station Indicator Co., Los Angeles, Cal. Magnetically actuated.

**1,117,731. Dynamo-Electric Machine.** H. B. Weir, assignor to Allis-Chalmers Mfg. Co. Special clamping ring for commutator.

**1,117,748. Molding or Conduit for Electric Wires.** P. Adison, New York, N. Y. Metal molding with interlocking flanges on base and cover sections.

**1,117,766. Submarine Signaling Apparatus.** C. Berger, New York, N. Y., assignor to Submarine Wireless Co. Microphone in chamber attached to hull of ship.

**1,117,768. Signal Lamp.** C. H. Bissell and A. E. Vieau, assignors to Crouse-Hinds Co., Syracuse, N. Y. Electric lamp with weatherproof housing, including cylindrical lens section.

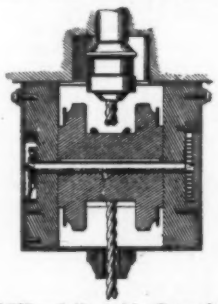
**1,117,786. Refrigerating Apparatus.** C. A. V. Carlsson, Washington, D. C., assignor of one-fourth to C. J. Carew. Includes air compressor driven by electric motor controlled by variation in pressure.

**1,117,796. Electrical Exercising Apparatus.** F. E. Coulter, Omaha, Neb. Exercising springs and foot plates connected with battery.

**1,117,815. Sleet-Cutter for Trolley Wires.** H. E. Eager and A. O. Hagee, Tipton, Ind. Mounted above the wheel.

**1,117,829. Bead Chain.** W. J. Gagnon, assignor to Bryant Electric Co., Bridgeport, Conn. For pull-chain sockets, etc.

**1,117,832. Signaling System.** H. C. Goldrick, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. For telephone party lines.



1,117,869.—Adjustable Drop Light.

**1,117,837. Induction-Coil Casing.** H. D. Grinnell, Pittsfield, Mass. Has telescopic cover and side hoods covering the terminals.

**1,117,841. Lamp.** W. S. Hamm, assignor to Adams & Westlake Co., Chicago, Ill. Mounted in tubular casing with slideway.

**1,117,843. Torpedo.** G. P. Helfrich, New York, N. Y. Includes motor-driven pump and a reel for the cable supplying current from the shore.

**1,117,857. Circuit - Interrupter for Therapeutical Apparatus.** F. M. Kidder and M. H. Kidder, New York, N. Y. Vibrator for induction coil.

**1,117,862. Automatic Signal and Stop for Railways.** L. C. Krummel, Clinton, Conn. Includes an electric latch.

**1,117,864. Signaling System.** M. E. Launbranch, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Telephone party-line ringing by intermittent current.

**1,117,869. Adjustable Electric Drop-Light.** M. J. Lindahl, Woodburn, Ore. Has cord reel in the canopy. (See cut.)

**1,117,872. Dynamo-Electric Machine and System of Control.** R. Lundell, New York, N. Y. Includes motor-generator exciter for field of main generator.

**1,117,879. Electrolytic Cell.** F. McDonald, Roaring Spring, Pa. A column of mercury is interposed between and supported by the diaphragm and cathode.

**1,117,888. Safety Appliance for Elevators.** J. Munkacsy, Newark, N. J., assignor of one-half to F. J. Fibish. Safety switch beneath floor of electric elevator.

**1,117,894. Electromagnetic Control Device for Exits of Sand-Boxes.** G. Orbin, Hoboken, Pa. Electromagnetically operated slide plate.

**1,117,950. Immersion Heater.** E. J. Ovington, assignor to Simplex Electric Heating Co., Cambridge, Mass. Inclosed in water-tight insulated casing.

**Reissue 13,830. Transformer.** N. A. Wolcott and W. C. Woodland, assignors to Packard Electric Co., Warren, O. Original No. 1,091,995, dated March 31, 1914. Special core construction.

### Patents Expired.

The following United States electrical patents expired November 30, 1914.

594,379. Electrical System of Propulsion. W. M. Brown, Johnstown, Pa.

594,382. Signaling System. H. A. Chase, Boston, Mass.

594,386. Electric Contact Device and Conductor Construction Therefor. J. M. Dortch, Johnstown, Pa.

**594,406. Traveling Contact Device for Electric Railways.** M. D. Law, New York, N. Y.

594,407. Telephone-Line Switch. G. Lay, Licking, Mo.

594,426. Electric Arc Lamp. H. R. Quinby, Rochester, N. Y.

594,435. Combined Gas and Electric Generator Plant. S. H. Short, Cleveland, O.

594,470. Electric Switch. G. W. Hart, Hartford, Conn.

594,471. Electrically Controlled Block Signal for Railways. R. J. Hewett, St. Louis, Mo.

594,488 and 594,489. Polycircuit Dynamo. I. R. Prentiss, Cleveland, O.

591,493. Electric Brake. S. H. Short, Cleveland, O.

594,575. Electrically Operated Switch. W. D. Stanton, Springfield, Mass.

594,585. Electric Arc Lamp. T. E. Adams, Cleveland, O.

594,614. Mechanism for Making, Breaking, and Switching Electric Circuits for Railway Signals. P. H. Forbes, C. C. French and A. Lee, Topeka, Kans.

594,618. Electric Switch. M. Guett, Hartford, Conn.

594,656. Electric Switch. F. Schwedtmann, St. Louis, Mo.

594,665. Electric Brake. W. Weihl, New York, N. Y.

594,678. Electric Burglar-Alarm. T. A. Clarke, Bootle, England.

594,682. Electric Arc Lamp. T. E. Drohan, Chicago, Ill.

594,687. Commutator. C. J. Greiner, St. Louis, Mo.

594,700. Electric Pleasure Railway. L. Lilley, Cincinnati, O.

594,702. Electric Railway. R. Lundell, Brooklyn, N. Y.

594,715. Switch-Operating Mechanism for Cars. M. M. Tremblay, Springfield, Mass.

594,744. Means for Controlling Electric Currents. P. Kennedy, Brooklyn.

594,745. Pole-Changing Mechanism for Electric Generators. P. Kennedy, Brooklyn, N. Y.

594,779. Regulating Electric Motors. A. G. Davis, Washington, D. C.

594,800. Electric Rail-Bond. S. W. Huff, Baltimore, Md.